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September 6, 2007

Mr. Michael Berkoff, Remedial Project Manager
U.S. Environmental Protection Agency, Region 5
77 W. Jackson Blvd. SR-6
Chicago, IL 60604

RE: Final Emergency Response Plan Design Report: 12th Street Landfill/Former Powerhouse Channel, Otsego Township, Michigan (Consent Decree, No. 1:05CV003)

Dear Michael:

Attached for your files is the replacement text and figures for the Final Emergency Response Plan Design Report for the 12th Street Landfill/Former Powerhouse Channel. This final report addresses the comments that you sent to me in your conditional approval letter dated August 15, 2007. As you discussed with Jim Hutchens, the changes have been incorporated into the text as a final document. For your convenience, we have also prepared Attachment 1 to this letter that summarizes our basic responses to your comments. In addition, Attachment 2 includes instructions regarding insertion of the new text into the binder that contained the initial draft final for the Powerhouse Channel Emergency Response Plan Design Report. Please discard the replaced text and two figures as noted, but retain all appendices and other figures since they have not been modified.

Thank you for your cooperation and assistance on this action. We appreciate your prompt attention to this matter and look forward to discussions regarding the Design Report. Please feel free to contact me, or Jim Hutchens or Kathy Huibregtse at RMT, if you have any questions.

Sincerely,

Weyerhaeuser Company

Jennifer Hale

Jennifer Hale
Environmental Manager

cmk/enclosures

cc: Jim Seric, USEPA (w/o enclosure)
Sam Chummar, USEPA (w/o enclosure)
Eileen Furey, USEPA (w/o enclosure)
Sam Borries, USEPA
Paul Bucholz, MDEQ
Keith Krawczyk, MDEQ
Daria Devantier, MDEQ
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Steve Garbaciak, Jr. BBL
Marty Lebo, Weyerhaeuser Company
Joe Jackowski, Weyerhaeuser Company
Mark Schneider, Perkins Coie
Kathy Huibregtse, RMT, Inc.
Jim Hutchens, RMT, Inc.

Attachment 1

Response to USEPA Comments
Emergency Response Plan Design Report
12th Street Landfill/Former Powerhouse Channel

1. Section 2.2.2: Haul Road/Work Platform – Having trucks back up a significant distance from the top of the landfill down the access road adjacent to the former powerhouse channel seems to be slow and potentially hazardous. It may be more practical to extend the temporary haul road to the south between Areas 1 and 2 and create a loop back to the road along the former powerhouse channel. Document changed to indicate road will be located to allow efficient access based on field conditions.

2. Section 2.2.3: Residuals Containment Area – What is the type and thickness of the existing landfill cover material? Will the removal of 2 to 3 feet of existing landfill cover material expose waste? Changes added to document - Cover contains a mixture of silt and sand. Existing thickness is reported to be 2 to 7 feet thick. If residuals are uncovered, they will be contained within the pad area.

3. Section 2.2.3: Residuals Containment Area – What is the water source for decontamination and dust control? Water will be delivered from off site and stored in temporary tanks on site.

4. Section 2.2.3: Residuals Containment Area – What is the cover material for Area 1 after disposal activities are completed? Cover material will consist primarily of the soil removed to form the berms and clean soil relocated from the banks. If necessary, additional fill soils will be imported or moved from other areas of the site to achieve the design thickness of temporary cover.

5. Section 2.2.3: Residuals Containment Area – The text states that excavated residuals will typically contain approximately 20 to 25 percent water by volume. This percentage appears to be low. Please provide the basis for this percentage. This percentage has been removed from the report since the percent solids will be controlled by various factors including the sediment characteristics and the effectiveness of the dewatering process.

6. Section 2.2.4: Soil Relocation Area – Area 2 is labeled as "mixed fill/paper residuals placement area" on Figure 3, but placement of paper residuals is not described in the text. Are paper residuals also intended to be removed from the eastern slope? It is anticipated that some paper residuals may be encountered during the reshaping of the eastern slope.

7. Section 2.2.5: On-Site Wastewater Treatment – It should be clarified that the 250-gallon effluent holding tank stores "treated" rather than "clean" water. Changed in text.

8. Section 2.4.1: Grading of Eastern Slope of Landfill – What is the basis for the design of the clay plug and the buffer zone to prevent a hydraulic connection between the waste and the river? Information has been added to this section of report describing the clay plug in more detail.

9. Section 3.1: Resuspension Monitoring and Control – The YSI multiparameter probes will be used to monitor turbidity and will log the values at 1-hour intervals. How often will someone download the data to see if turbidities are elevated in the downstream direction? Twice per day – added to section.

10. Section 3.1: Resuspension Monitoring and Control – The text states that three of these units will be used in the monitoring efforts, but does not say how these three units will be distributed between upstream and downstream. Additional description was added to text. The locations for the monitoring units are 200 feet downstream and upstream and between the inner and outer silt curtains in the secondary retention area.

11. Section 3.1: Resuspension Monitoring and Control – Surface water samples will be collected on a weekly basis and analyzed for PCBs by an offsite lab. What turnaround time will be used to allow some ability to react if elevated concentrations are seen? 24 to 48 hours after receipt of the samples at the laboratory has been added to text.

12. Section 3.2: Wastewater Treatment System Discharge Monitoring – The text states that the effluent sampling point is "downstream of the holding tank." This should be clarified to state "downstream of the effluent holding tank." Changed in text.

13. Section 3.2: Wastewater Treatment System Discharge Monitoring – How often will the turbidity of the sedimentation tank effluent be monitored to compare it to background readings in the river? Monitored hourly during pumping operation – added to text.

14. Section 3.2: Wastewater Treatment System Discharge Monitoring – Appendix G is the CQAP, not the FSP as stated in the last paragraph in this section. Reference to Appendix removed from text.

15. Section 3.3: Residuals Excavation Documentation Sampling – Please provide some clarification on the residuals excavation sampling.

    a. The text identifies that samples from the six nodes randomly selected for sampling will be inspected for residuals. Will the visual inspection for residuals be performed in each node, or only in the six nodes which are sampled? Visual residual identification will be performed during the entire removal process to verify all contiguous residuals have been removed in accordance with the ROD. The confirmation samples will be at the six nodes. The text has been clarified.

    b. The text states, "If residuals are observed in the samples, then additional sediment (targeting an initial 6-inch depth) will be excavated." Over what area will the additional excavation be performed? The text has been modified to describe that any additional excavation needed will be across the approximate 20 foot by 20 foot grid area.

16. Figure 4 – The figure identifies a layer that would be comprised of residuals and soils. The figure label identifies this as a potential layer. In either the text of the document or as a note with in the figure, please identify the source for this potential layer. Figure modified to further describe areas in question.

17. Figure 7 – According to the schedule, it appears the reshaping of the landfill bank will be done after the paper residuals are excavated. It may be beneficial to conduct these activities concurrently if dry soil from the landfill bank is needed to mix with the paper residuals for dewatering/drying. The text and schedule reflect that the bank will be partially regraded prior to channel excavation to facilitate access to the channel.

Attachment 2

Section	Action
Binder	Replace with revised binder cover, add spine
Report Text	Replace with revised text
Figures	Replace Figure 4 and Figure 7, retain Figures 1, 2, 3, 5, and 6
Appendix A	Replace cover sheet, No change to remainder
Appendix B	Replace cover sheet, No change to remainder
Appendix C	Replace cover sheet, No change to remainder
Appendix D	Replace cover sheet, No change to remainder
Appendix E	Replace cover sheet, No change to remainder
Appendix F	Replace cover sheet, No change to remainder
Appendix G	Replace cover sheet, Replace with revised text

12th Street Landfill/Former Powerhouse Channel
Emergency Response Plan Design Report
Weyerhaeuser Company
Otsego Township, Michigan
September 2007
RMT Project No. 00-05130.02

Emergency Response Plan Design Report

12th Street Landfill/Former Powerhouse Channel
Otsego Township, Michigan

Operable Unit No. 4 of the Allied Paper, Inc./
Portage Creek/Kalamazoo River Superfund Site

September 2007

Prepared for
Weyerhaeuser Company

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Emergency Response Plan Design Report

12th Street Landfill/Former Powerhouse Channel Otsego Township, Michigan

Operable Unit No. 4 of the Allied Paper, Inc./ Portage Creek/Kalamazoo River Superfund Site

September 2007

Prepared for
Weyerhaeuser Company

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Section 1
Introduction

1.1 Background and Scope

The Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site (Site) located along 80 miles of the Kalamazoo River in western Michigan has been investigated by the United States Environmental Protection Agency (USEPA), Michigan Department of Environmental Quality (MDEQ), and the Kalamazoo River Study Group (KRSG). After the site was listed on the National Priorities List in 1990, the MDEQ took the role of the lead agency addressing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) related liability. The KRSG, a group consisting of current paper mill property owners, conducted a series of investigation activities and completed a Remedial Investigation/Feasibility Study (RI/FS) in 2001 that was not approved by the MDEQ.

In February 2002, the USEPA assumed the role of lead agency for the Site at the request of the MDEQ, and on April 8, 2004, Weyerhaeuser Company (Weyerhaeuser) was identified as a Potentially Responsible Party (PRP) for the Site in a General Notice letter received by Weyerhaeuser and the two remaining KRSG members, Georgia Pacific and Millennium Holdings, LTD. Concurrently, Weyerhaeuser was negotiating a Consent Decree (CD) with the USEPA to undertake specific activities on the former Plainwell Mill and 12th Street Landfill sites. On February 22, 2005, Weyerhaeuser entered into a CD with the USEPA for the Design and Implementation of Certain Response Activities at the 12th Street Landfill site (Operable Unit No. 4) and the Plainwell Mill site. A Statement of Work (SOW) for the Remedial Design/Remedial Action (RD/RA) at the 12th Street Landfill site was attached to the CD. A SOW for the RI/FS at the Plainwell Mill site was subsequently issued by the USEPA, with an effective date of
August 17, 2006.

In late February 2007, after a several year negotiation with the KRSG, the USEPA authorized a Time-Critical Removal Action (TCRA) to remove PCB-contaminated residuals in the former Plainwell Impoundment (a section of Operable Unit No. 5 of the Allied Paper/Portage Creek/Kalamazoo River Superfund Site). This work was to be implemented through an administrative settlement agreement and order on Consent for Removal Action (V-W-07-C-8-63). As part of the TCRA, the earthen section of the Plainwell Dam will be removed and the Kalamazoo River will be rerouted through the former powerhouse channel. This work will be conducted by the KRSG over a 2-year period.

The 12th Street Landfill abuts the river and is located directly downstream of the earthen section of the Plainwell Dam. The Plainwell Mill also abuts the Kalamazoo River and polychlorinated biphenyl (PCB) containing materials have been documented along the river bank at the Mill. The change in the

Kalamazoo River channel will result in an increased river gradient and higher velocities upstream and along the rerouted channel (Rachol, et al., 2005 and Wells, et al., 2003). The modified river flow routing is expected to flush residuals currently present in the powerhouse channel downstream and the increased river gradient may erode bank material in the area of the Mill. Thus, the TCRA scope of activities are actions or occurrences which threaten releases of Waste Material (as defined in the CD) from both the 12th Street Landfill and the Plainwell Mill property. Since any such release may present an immediate threat to public health or welfare of the environment, Weyerhaeuser has been authorized by the USEPA to conduct emergency response actions in conjunction with completing the required work under the CD.

1.2 Objectives of the Former Powerhouse Channel Emergency Response

The necessary work to address the threatened release will be conducted under Section XVII Emergency Response, paragraph 67 of the Weyerhaeuser CD. This Emergency Response Design report documents the appropriate actions and schedule to prevent, abate, and minimize the release of residuals present within the former powerhouse channel adjacent to the 12th Street Landfill and the potential release of waste present on the eastern side of the landfill near the proposed re-routed channel of the Kalamazoo River. The location of the 12th Street Landfill site is depicted on Figure 1. Both removal of residuals and the construction of an erosion control system along the river are identified as components of the selected remedy described in the 2002 Record of Decision (ROD) for the 12th Street Landfill (Operable Unit 04). However, since the approved schedule for the Plainwell Impoundment TCRA involves re-routing of the main channel of the Kalamazoo River before the 2008 construction season, a modified schedule for implementation of these remedy tasks was necessary and is integrated into the Former Powerhouse Channel Emergency Response.

The specific objectives of this Former Powerhouse Channel Emergency Response are:

- To remove visual paper residuals from the channel before the main flow of the Kalamazoo River is re-routed.
- To install a final erosion protection system along the former powerhouse channel west bank that meets the requirements of the existing ROD.
- To construct these systems in a manner compatible with the specified landfill closure requirements as specified in the 2002 Record of Decision.

1.3 Design Report Organization

In addition to this introductory text, the remaining sections of the streamlined design report present the final description of the Former Powerhouse Channel Emergency Response followed by a series of appendices that present the results of supplemental data collection and the design basis for the Emergency Response actions. The sections and appendices consist of the following:

- Section 2 – Design Basis and Description: A description of each element of the emergency action from the construction of access roads and staging areas to the various components of the removal activities (water control, residuals and soil removal, drainage, material processing and disposal) are

discussed. The discussions include: the basis of design for elements including delineation of the removal areas; a description of existing conditions; a summary of the hydraulic analysis conducted in support of the erosion protection and slope stability design; and the selection and development of residuals dewatering and drainage equipment and procedures.

- Section 3 – Monitoring Plan: A description of the various monitoring activities are described, including resuspension monitoring, dewatering system discharge monitoring, residuals removal confirmation, and monitoring of the erosion control system.
- Section 4 – Construction Schedule: Description of the construction and implementation schedule for the emergency response action.
- Section 5 – References: Identification of any references cited in this report.
- Appendix A: Relevant correspondence associated with the 12th Street Landfill site.
- Appendix B: Water depths and extent of residuals identified in the former powerhouse channel.
- Appendix C: Discussion of the results of the geotechnical investigation performed at the 12th Street Landfill to identify the presence and construction details of a reported containment berm.
- Appendix D: The United States Army Corps of Engineers (USACE)/MDEQ joint permit application and National Pollutant Discharge Elimination System (NPDES) permit application to show substantial compliance and equivalence to the permits.
- Appendix E: Slope stability calculations used in the slope design for the east face of the 12th Street Landfill.
- Appendix F: Calculations used in design of the erosion protection system along the former power house channel.
- Appendix G: Construction inspection and quality control for implementation of this design plan.

Section 2
Design Basis and Description

2.1 Overview of the Design Components and Approach

The Former Powerhouse Channel Emergency Response actions have been separated into five primary components that are described in detail in the remainder of this section. These include Site Preparation, Residuals Removal, Landfill Slope Protection, Erosion Protection, and Vegetation. The subparts of each component are described in this section with more detail design support in the referenced appendices. The various monitoring and confirmation sampling activities are discussed in Section 3.

The overall approach to these Emergency Response activities is to complete those actions along the 12th Street Landfill that will minimize the potential for a release of waste. In addition, most of these actions will become part of the completed final remedy for the 12th Street Landfill since certain bank related construction activities will not be practicable once the main channel of the Kalamazoo River is rerouted. Finally, the work efforts will be performed on a schedule that is coordinated with the Plainwell Impoundment TCRA efforts.

2.2 Site Preparation

Construction activities associated with the emergency action will begin in early August 2007. Project support areas, consisting of temporary trailers, material storage areas, and equipment/vehicle parking areas will be established to provide critical support services, such as field engineering, health and safety, construction management, equipment maintenance and refueling, equipment and personnel decontamination, worker sanitation, project area security, and access control. The support areas will be located near the entrance to the 12th Street Landfill. The existing site layout for the 12th Street Landfill is shown on Figure 2.

A temporary access road will be constructed from the entrance to the 12th Street Landfill to both the support areas and the area along the former power house channel. The road will be field located to work with the existing site contours and to minimize disturbance to the existing landfill surface.

Site preparation will involve clearing and grubbing as required to allow placement of the access road, a working area along the channel, and two pad areas for staging of excavated residuals and soils. The access haul road/work platform from the 12th Street Landfill to the powerhouse channel and along the channel adjacent to the landfill will be constructed and reinforced as necessary to accommodate loaded trucks. Two material placement pads will be constructed at the top of the landfill, one to contain residuals from the channel (Area 1) and one for relocation of the excess material from the face of the landfill (Area 2). These pads will be located on the top of the landfill in locations not targeted for re-grading

during final closure (Figure 3). An interim cover will be placed over the excavated materials until final closure of the 12th Street Landfill site.

2.2.1 Clearing and Grubbing

The areas requiring clearing and grubbing include: 1) the east bank face of the landfill, which will be reshaped as part of the erosion control; 2) an area along the north side of the landfill to allow construction of the haul road; and 3) two areas on the top of the landfill each approximately 200 feet wide by 200 feet long. Prior to any clearing along the channel, silt fencing will be placed along the channel to minimize any soil runoff into the river.

Vegetation will be cleared only to the extent required to establish access roads, staging areas, project support areas, and residuals/soil excavations. Cleared vegetation will be chipped and used as mulch for constructing pathways, as temporary vegetative cover to support erosion control efforts in the project area, or as a residuals/soil solidification amendment. Larger tree trunks and stumps derived from clearing will be stockpiled on site for either later beneficial reuse, disposal or incorporation into the landfill. Root wads, to the extent possible, will be disposed within the landfill

2.2.2 Haul Road/Work Platform

A single-lane haul road and work platform will be constructed along the north side of the landfill to allow truck access to the channel for residuals transport. The haul road will be approximately 15 feet wide and constructed at a grade or design slope which will allow trucks to easily traverse from the top of the landfill to the channel. In addition, the road will extend along the channel to the south to allow the excavator access to residuals within the channel. The roads will be constructed by placing a geotextile fabric over prepared ground surface, followed by placing and compacting up to 1 feet of stone and gravel as necessary for support. Based upon field conditions, the road will be located to allow efficient access to loading at the channel and unloading at the containment pad. Once loaded, the trucks will proceed to the residual containment area or soil relocation area for dumping.

2.2.3 Containment Area for Residuals from Powerhouse Channel

An area designated for placement of the residuals from the powerhouse channel will be constructed at the top of the landfill (Containment Area 1, Figure 3). The containment area will be approximately 200 feet wide and 200 feet long. Prior to placing residuals in this area, the existing landfill cover material, which is reported to consists of approximately 2 to 7 feet of general fill, will be graded to a depth of approximately 2 to 3 feet pushed out to form a containment berm along the edges of the containment pad. Any waste material uncovered during construction will remain within the containment area. Once the area is excavated, a 1-foot thick

sand layer will be placed to facilitate dewatering. The grade of the pad will allow any excess water to drain to a constructed sump. The sump will be constructed by excavating a 3-foot deep pit and placing filter material consisting of open-graded crushed stone around an 8-inch diameter perforated PVC vertical standpipe. As needed, water will be pumped from the standpipe to the treatment facility.

The residuals will primarily be drained by gravity. As needed, based on the consistency of the material removed from the powerhouse channel, Containment Area 1 may also be used to solidify residuals. If needed, dry soil mixing, decanting, and/or the addition of solidification agents, such as lime or cement, may be used.

A 25-foot by 200-foot area south of the residuals containment area will be used for decontamination of equipment. Clean water from off-site sources will be provided for decontamination and/or dust control and will be stored in temporary on-site tanks. All water collected during decontamination will be collected in the pad sump and routed through the on-site water treatment unit.

Once the residuals have been placed in Containment Area 1 and any free liquids removed, the cover soil used to create the containment berms will be placed over the relocated residuals as an interim cover. A minimum of 1 foot of interim cover soil will be placed over the relocated residuals. If needed, additional general fill from other areas of the site or an off-site source will be utilized to achieve the target thickness (1 foot) of interim cover soil over the relocated residuals. The final cover will be constructed as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Action.

2.2.4 Relocation Area for Mixed Fill/Paper Residuals from Eastern Slope of Landfill

An area designated for placement of mixed fill/paper residuals relocated from the eastern slope of the landfill will also be constructed at the top of the landfill (Area 2, Figure 3). The 200-foot by 200-foot area will be located adjacent to Containment Area 1. The cover thickness in this area has been reported to range from 2 to 7 feet of general fill and the closest boring log (leachate head well LH-1) documented a cover thickness of 2.5 feet (Geraghty & Miller, May 1994). Prior to placing excavated material in Area 2, the existing landfill cover material will be excavated to the top of the residuals or to a depth of approximately 2 to 3 feet, whichever is less. The excavated cover soils will be pushed out to form a containment berm along the edges of Containment Area 2. The material from the eastern slope of the landfill will be placed in Containment Area 2 and graded to provide positive drainage until covered. Precipitation will be contained within the berms. Free liquids, if any, will be minimized by the addition of dry soil or by pumping the water to the on-site treatment system. Once the mixed fill/paper residuals have been relocated and free

liquids, if any, removed, the cover soil used to create the containment berms will be placed over the relocated slope material as an interim cover. A minimum of 1 foot of interim cover soil will be placed over the relocated mixed fill/paper residuals. If needed, additional general fill from other areas of the site or off-site sources will be utilized to achieve a minimum of 1 foot of interim cover soil over the relocated mixed fill/paper residuals. The final cover will be constructed as part of the CERCLA Remedial Action.

2.2.5 On-Site Wastewater Treatment

The on-site wastewater treatment system will consist of a 20,000-gallon equalization/ sedimentation holding tank, followed by bag filters and carbon adsorption columns. The multimedia filters and carbon columns will be trailer-mounted. A small effluent holding tank (approximately 250 gallons) will also be used to provide a sampling location and to store treated water for backwashing and selected decontamination. General specifications of the wastewater treatment system are identified below:

- Pump system: Two 100 gpm vfd pumps. Includes level sensors within the sump that would turn off the pump when the low level reached and turn on at the high level set point.
- Four LCO8 bag filters
- Ten 900-pound granular activated carbon filters

The on-site wastewater treatment system will have a maximum design capacity of 200 gpm. Flow rates will be maintained by pumping a controlled volume from the holding tank. The volume of water that requires treatment will be controlled primarily by the volume and turbidity of the infiltration water entering the excavation area. The rate and staging of the residual removal activities may be modified to remain within the 200 gpm capacity of the treatment system. Alternatively, additional storage capacity may be added.

2.3 Residuals Removal

2.3.1 Portadam Placement/Dewatering

The Portadam (or equivalent) system is a temporary, portable water diversion and cofferdam structure. The equipment proposed consists of tubular steel structural support members assembled in a line with a continuous vinyl liner membrane placed along the face as a water stop.

To minimize the amount of water entering the Portadam area once it has been dewatered, a clean-water seep collection trench will be excavated along side the Portadam structure. This trench will be 1 to 2 feet deep and the width of the excavator bucket. The installation of the trench will include a sump area that will accumulate the infiltrating water. The sump pit will consist of a standpipe constructed by perforating a 12- to 36-inch diameter pipe, then wrapping it with ½-inch

hardware cloth and geotextile Class E. A base of filter material consisting of clean gravel (minimal fines) will be placed in the pit to a depth of 12 inches. After installing the standpipe, the pit surrounding the standpipe will then be backfilled with the same filter material. During excavation activities, a pump will be operated automatically through float switches and the water pumped from the sump to the secondary retention area for further retention and settling (see Section 2.3.2) or to the on-site wastewater treatment system (see Section 2.2.4) if treatment is required.

Figure 3 shows the estimated location of the Portadam structures within the Kalamazoo River. Details of the Portadams are shown of Figure 6. Deployment of the Portadam will begin by placing the Portadam stanchions upstream of the area to be dewatered and run at approximately a 60° angle out to the peninsula between the existing main channel and the former powerhouse channel. The liner will then be placed on the framing, then secured to the stanchions with pins at the top and then spread out into the river at the base of the structure. The liner will be held in place using sand bags.

All water removal actions will be completed in a manner that minimizes the potential uptake of residuals into the pumps and minimize any accidental discharge of solids into the Kalamazoo River. Water from the initial pump down (to approximately 6 inches above the sediment surface) is expected to be clear decant water that will be pumped directly into the river or into the secondary retention area outside the Portadam as described below.

2.3.2 Secondary Retention Area

A secondary retention area will be constructed by placement of double silt turbidity control curtains adjacent to the isolation area created by the Portadam. (see Figure 3). The purpose of the area is to receive the pumped infiltration water from the sump next to the Portadam and provide additional retention. The water will be pumped from the excavation area into a metal or concrete dispersion unit located within the first silt curtain area. The water will then overflow the dispersion unit and flow through the silt curtains. The size of the area will be established in the field. The two silt curtains will be placed about 2 to 3 feet apart to allow access for monitoring turbidity. These turbidity readings will be compared to background values. If the measured turbidity is greater than 2 times the background value, the water from the Portadam sump will be directed to the holding tank for treatment and a series of response actions will be completed as described in Section 3.1.

2.3.3 Residuals Removal Operations

The 12th Street Landfill ROC and SOW require excavation and relocation of residuals in the former powerhouse discharge channel that are contiguous with the eastern side of the landfill.

Based on the information identified in Appendix B, approximately 300 to 500 cubic yards of visually identifiable paper residuals located contiguous to the Landfill will be removed from the former powerhouse channel. Residuals removal operations will be accomplished primarily with a long-reach excavator, which will be positioned as close to the water's edge as possible while still allowing safe operations. From this vantage point, the excavator will reach up to 50 feet horizontally into the river to remove visually impacted residuals contiguous to the landfill. If additional areas of contiguous residuals are identified beyond the safe reach of the excavator, crane mats or constructed pads will be placed out from the shore to allow access to additional material. As the excavator advances toward the shoreline, near-shore residuals will be removed to allow placement of the erosion control system. During excavation activities, the Portadams will be inspected routinely and erosion controls, and water collection and treatment systems will be used to prevent potential impacts to downstream water quality.

The soils adjacent to the river will also be removed to allow placement of an erosion control system and limit the potential for the river to come in contact with paper residuals from the landfill. The landfill bank soil removal activities are discussed in Subsection 2.4.1. The landfill bank soils will be removed in an areas extending 25 feet from the existing bank to an elevation of approximately 700 feet above mean sea level (M.S.L.).

2.3.4 Residuals Dewatering and Disposal

Wet excavated materials will be drained and stabilized at the pad area on top of the landfill (Area 1) through gravity drainage. Water draining from the residuals will be collected, treated, and discharged to the river. Temporary erosion controls (*e.g.*, sumps, silt fence material, earthen berms) will be installed to contain the decant water and storm water runoff and limit uncontrolled discharges to the Kalamazoo River.

The water accumulated from residuals placed into the residuals containment area will be managed via passive filtration and treatment (as necessary) and returned to the Kalamazoo River in a manner equivalent to a permitted NPDES discharge. The residuals will be placed in one end of the containment pad. Filter fabric and sand berms will be constructed within the residuals containment area on the opposite end. Filtered water that migrates through the sand berms into the collection sump areas will be pumped to tanks and then through an on-site mobile treatment plant prior to discharge.

2.4 Landfill Slope Protection

2.4.1 Grading of Eastern Slope of Landfill

Section I.1. of the ROD requires that the eastern side of the landfill along the powerhouse channel be excavated and relocated further into the landfill to create a buffer zone to provide hydraulic separation between the landfill contents and the river (see Subsection 2.4.2 for details), and to provide space in which to construct an access road. The eastern slope of the landfill will be cut back approximately 25 feet from the river[1] and graded to a slope of 5 horizontal to 1 vertical (5H:1V). Cutting the eastern slope back 25 feet will provide the airspace needed to place the required final cover (a future activity that will be performed as part of the Remedial Action under the CD for the 12th Street Landfill), which, in conjunction with a "clay plug" at the toe of the slope, will provide the requisite hydraulic separation. It will also provide sufficient space to construct an access road. The existing grade along the eastern sideslope, and the proposed cutback and final grades are shown on Figure 3, with a cross section of the slope shown on Figure 4. All materials excavated from within the 25-foot setback area (approximately 4,800 cubic yards) will be relocated further into the 12th Street Landfill (Area 2 on Figure 3.)

As described in Appendix C, a geotechnical investigation was performed in May 2007 to determine the location of a previously reported berm along the eastern side of the landfill in order to assist in designing the modifications to the eastern slope of the landfill. Because this investigation did not identify a structural berm along the eastern side of the landfill, cutting the slope back 25 feet and grading the slope to a less steep grade will not adversely affect the future stability of the eastern slope of the landfill. This was verified with a slope stability analysis (refer to Appendix E) that evaluated potential worst-case conditions for the 5H:1V slope along the river.

MDEQ Waste and Hazardous Materials Division regulations (R299.4910) stipulate analysis for landfill slope stability, but do not define required factors of safety against slope failure. Generally a value 1.5 factor of safety with respect to strength under static conditions (*i.e.,* the ratio of the average shear strength of the soil over the average shear stress developed along the potential failure surface) is acceptable and common in geotechnical design of stable constructed slopes (Das, 2002). The slope stability for two slope configurations (4H:1V and 5H:1V) under three different scenarios were modeled (see Appendix E). The most conservative condition modeled incorporated both the assumptions of groundwater conditions at the landfill surface and the presence of destabilized paper residuals caused by construction activities or increased loading from additional residuals and cover materials. These combined conditions resulted in modeled factors of safety of 1.58 for the 5H to 1V slope and 1.30 for the 4H to 1V slope. Given the severe implications of slope failure for the eastern slope adjacent to the rerouted Kalamazoo

[1] The location and elevation of the river used as the basis for the proposed design was measured on April 4, 2006, at staff gauge SG-RIVER, next to the 12th Street Landfill.

River, the 5H to 1V slope was used for that slope face. In contrast, the remaining slopes with less dire failure scenarios were preliminarily designed to reflect a 4H to 1V slope. These assumptions were then used to establish preliminary side slope locations and thus provide information needed to locate the two material placement pads at the top of the landfill.

As shown on Figure 4, an approximately 15-foot wide "clay plug" will be installed along the toe of the regraded eastern sideslope up to approximately 702.5 feet M.S.L. The "clay plug" will be installed during this Emergency Action to avoid having to rework this area in the future and meet the requirement for creation of a buffer zone to separate the landfill contents from the river. This 15-foot wide "clay plug" provides permanent and effective hydraulic separation of the landfill contents that are located behind the barrier (clay plug) from contact with surface water in the river. The clay plug also provides a low permeable soil to tie in the final cover (a future activity), the hydraulic separation from the river as the PVC portion of the final cover described in the ROD. Directly to the east of the "clay plug" (toward the river), general fill will be placed to bring the remaining portion of the buffer zone up to elevation 702.5 feet M.S.L. A 6-inch thick topsoil layer will be placed over the "clay plug" and general fill in order to establish vegetation (grass) over the area. The "clay plug," general fill, and topsoil will be placed in accordance with the requirements of the Construction Quality Assurance (CQA) Plan located in Appendix G.

2.4.2 Buffer Zone

The Statement of Work (SOW) for the Remedial Design and Remedial Action at the 12th Street Landfill requires that the excavation along the east side of the landfill be extensive enough to create an adequate buffer zone to ensure no direct contact between the PCB-contaminated waste and the Kalamazoo River and to provide installation and access for groundwater monitoring wells. The buffer zone created along the former powerhouse channel will consist of the regraded slope and the clay plug that extends a minimum of 25 feet from the landfill to the Kalamazoo River bank and provides thus hydraulic separation between the paper residuals and surface water. This area also includes a horizontal working area, which allows future installation of, and access to, groundwater monitoring wells. The elevation of the working platform will be approximately 703 feet M.S.L., which will allow for access during normal river conditions.

2.4.3 Intermediate Cover on Side Slopes

After the eastern slope of the landfill is cut back 25 feet, a 1-foot–thick intermediate cover will be placed up the 5H:1V sideslope. The intermediate cover will consist of a 6-inch thick general fill layer overlain by a 6-inch thick topsoil layer. The intermediate cover will be tied into the existing cover at the top of the slope, the clay plug at the toe of slope, and along the northern and southern end of the work area such that no paper residuals are left exposed (refer to Figure 3).

2.5 Erosion Protection

The ROD requires an erosion protection system to provide protection from a 500-year flood event. The ROD also states that the erosion protection will extend to a minimum elevation of 2 feet above the 100-year flood elevation or to a minimum elevation of 707 feet M.S.L. based upon the current dam in-place scenario. Calculations contained in Appendix F indicate that the Kalamazoo River would rise to approximately elevation 705.5 feet M.S.L. during a 500-year flood event. Modeled river velocities reported in the Plainwell Impoundment TCRA Design Report (Arcadis, 2007), show that erosion and/or undercutting could lead to bank failure in this area. Therefore, erosion protection is necessary as an Emergency Action. The conceptual approach to construction of the erosion protection system is to construct an integrated erosion protection system that will extend from the bottom of the river, following excavation of residuals in the discharge channel, up the regraded eastern slope of the landfill, and extend to elevation 707 feet M.S.L.

2.5.1 Related Emergency Response Decisions and Design Approaches

Other aspects of this 12th Street Landfill Emergency Response were integrated into the design and decision making for the erosion control system. Specific aspects of the Emergency Response and existing ROD that were developed separately and integrated into the erosion control system design are described below:

- Bank Slope at River's Edge: The erosion protection system along the 12th Street Landfill needs to be integrated with the erosion protection system being installed along the adjacent MDNR property (to the south of 12th Street). Thus the design will specify a 3H:1V slope from river's edge to elevation 701 feet M.S.L. which mimics the adjacent design slope.
- RipRap Integration: The riprap material sizes may be different between the landfill and MDNR property, so the riprap will need to be blended to limit abrupt changes along the water flow path. After the majority of the erosion system is placed, rocks will be positioned by hand to create the appropriate flowpath. The rip rap will extend from the MDNR property to approximately 10 feet north of the landfill footprint.
- Placement of a Clay Barrier Zone: The ROD requires creation of a buffer zone to insure that no hydraulic connection exists between PCB-contaminated waste and the Kalamazoo River. The design includes a 2.5 feet deep clay plug behind regraded slope to provide this physical separation between possible fill material and the surface water.
- Access Road: Since the ROD requires on-going groundwater monitoring, a nominally 10-foot wide access road will also be installed along the eastern slope of the landfill to provide a location for final monitoring well construction and access for sampling (refer to Figures 3 and 4). Erosion control matting will be installed over the access road.
- Erosion Control Material Types: Based upon conversations with various agency representatives and review of the Plainwell Impoundment TCRA design report, the state agencies prefer use of as natural erosion protection as possible. Therefore, the erosion system considered is a combination of riprap near the riverbank to an elevation of 703 feet M.S.L. and erosion control matting at higher elevations.

2.5.2 Riverbank Protection

Riverbank protection has been developed based upon resistance to the erosion from the rerouted Kalamazoo River through the former powerhouse channel (see Appendix F) and the impacts of ice and debris. The maximum flow velocity of the 500-year event along the 12th Street Landfill shoreline and landfill sideslope was estimated to be 5.7 feet per second (fps). The calculation for riprap size shows that riprap with a D_{30} of 2 inches will be able to withstand the erosive forces produced along the shoreline and landfill sideslope from the 500-year flood event. The riprap erosion protection has also been designed to resist potential ice and debris (*e.g.*, fallen trees) damage. Ice and debris create greater stresses on riprap revetment by impact and flow concentration effects (USACE, 1994). The USACE recommends that the thickness of the riprap should be increased by 6 to 12 inches, accompanied by appropriate increase in stone size, for riprap subject to attack by large floating debris. Riprap deterioration from debris impacts is usually more extensive on banks lined with steep slopes, therefore, the USACE recommends that riprapped slopes on streams with heavy debris loads should be no steeper than 2.5H:1V. In order to address this concern at the 12th Street Landfill, the stone size and thickness has been increased, and the riverbank slopes will be regraded to 3H:1V. Thus the riverbank protection design has been specified to use a larger stone (D_{50} of 9 inches) to address the greater potential stresses on the riprap caused by ice and debris (*e.g.,* fallen trees).

Riverbank protection will be provided by a minimum 2-foot lift (thickness) of specified riprap from the bottom of the river to the elevation of the access road at approximately 703 feet M.S.L., and by a turf reinforcement mat along the sideslope of the landfill, extending from the top of the riprap to elevation 707 feet M.S.L. The riprap will have a D_{50} of approximately 9 inches and will be angular in shape (rounded stone may be substituted as determined to be appropriate by the Engineer). No stones will be less than 3 inches in diameter or greater than 15 inches in diameter. As recommended in MDOT (2003) guidance, an 8-ounce nonwoven geotextile fabric will be installed under the stones/rocks to prevent erosion of the underlying general fill layer or native soil. If the stable historic river bed is found to occur at the toe of slope, the rock will be placed on the bed and up the slope (this determination will be made in the field with input from the USEPA and MDEQ oversight staff). If a stable bed is not present at the toe of slope, bank toe protection will be provided by keying the rock into the river bed to a depth of 1 foot to protect against bank undercutting. The backup for this riprap design are contained in Appendix F. Erosion protection along the disturbed bank area will be provided by the placement of a turf reinforcement mat (Enkamat® or similar)[(2)] from elevation 703.0 feet M.S.L. across the access road and up the sideslope to elevation 707 feet M.S.L. The turf reinforcement mat will be capable of

[(2)] Enkamat® is a three-dimensional nylon turf reinforcement mat made of polyamide (nylon) filaments joined at the intersections. Ninety-five percent of the matrix is open space, which supplements natural erosion control by reinforcing the plant roots. As the roots grow, they become entwined within the Enkamat,® creating a stable cover.

withstanding river velocities produced by a 500-year flood event (5.7 feet per second) (refer to the hydraulic calculations in Appendix F).

The riprap and the turf reinforcement mat will be installed in accordance with the requirements of the CQA Plan in Appendix G.

The habitat quality and stability of the rock-armored banks may be enhanced by the planting of live willow stakes into the interstices of the river rock. As the willow stakes grow, their roots should stabilize the banks, and the submerged and overhanging foliage would provide flow refuge, shade, and habitat for macroinvertebrates. Root wads (including the root mass the willow stakes would form, as well as buried tree stumps derived from the project area clearing activities) would provide similar functions, but would primarily function to receive and deflect the water away from the bank and towards the center of the channel. The number and locations of the willow stakes will be determined based on field conditions.

2.6 Vegetation

All disturbed areas will either be seeded and mulched, or hydro-seeded based on field conditions. Fertilizer will be applied only if needed. The seed mix will be applied at a rate of approximately 63 pounds per 1,000 square feet. Mulch may be applied at a rate of 2 to 3 tons per acre. The CQA Plan (Appendix G) provides additional information about seed, possible fertilizer applications and use, and mulch placement.

The area where the turf reinforcement mat is placed will be seeded and/or hydro-seeded in accordance with the requirements of the CQA Plan, which in general requires seed to be placed on the topsoil prior to the installation of the turf reinforcement mat and then hydro-seeding the turf reinforcement mat after it is installed.

To help establish a more natural look along the river, up to 50 willow stalks may be planted along the river's edge within the riprap. The stalks would be placed just up-slope of the normal river elevation to help promote the growth of the willow trees. Once established, the willow trees and the other plant growth that should naturally fill-in between the riprap, providing additional protection from erosion and ice flows.

Section 3
Monitoring Plan

The emergency response action monitoring plan has multiple components with different objectives. Overall, monitoring will provide information to minimize adverse secondary impacts from the Emergency Actions and to confirm the results of the remedial activities. In general, the monitoring approach is consistent with that being performed under the Plainwell Impoundment TCRA. Modifications to the TCRA approach have been made when monitoring objectives for these Emergency Actions are different. The components of the monitoring plan and the associated Powerhouse Channel Emergency Action objectives are:

- *Resuspension Monitoring and Control* – To provide real time water quality data to minimize the potential for residuals releases to the Kalamazoo River. This sampling will form the basis for adjusting the Emergency Response Actions as necessary.
- *Wastewater Treatment System Discharge Monitoring* – To verify the wastewater treatment system effectiveness and document compliance with ARARs.
- *Residuals Excavation Documentation Sampling* – To document PCB concentrations in residuals remaining in the former powerhouse channel after completion of emergency response activities.
- *Erosion Control and Vegetation Monitoring* – To ensure long term effectiveness of the river bank erosion control system.

3.1 Resuspension Monitoring and Control

The potential exists for secondary release of residuals during the excavation activities being conducted in the former powerhouse channel. As described previously, the design of the excavation actions has been developed to minimize potential adverse effects from this excavation work by completing the residual removal activities and bank re-grading prior to re-routing the river channel. An additional safeguard is to implement a resuspension monitoring program that provides real time water quality data for use in assessing a need for operational changes that minimize any unintended secondary effects.

The approach integrated into the resuspension monitoring and control plan is to compare turbidity data collected upstream and downstream of the former powerhouse channel as a mechanism to track the impacts of the excavation activities on water quality. If the turbidity from the downstream station exceeds twice the measured turbidity as the upstream sampling location, a series of contingency responses are implemented to minimize possible adverse impacts. The turbidity data are also supplemented by weekly PCB analyses and visual inspections of the water barriers associated with the residuals isolation area. Specific components of the resuspension monitoring plan that will be performed during actual excavation actions in the former powerhouse channel are summarized in Table 3-1 located at the end of this section.

The use of turbidity as the real time water quality indicator parameter is based upon the following rationale:

- Turbidity measurements are rapid, easy to instrument, reliable and commonly used to monitor suspended solids during the on-going Plainwell TCRA as well as various residuals excavation projects across the country.
- Turbidity has been shown to be well correlated to Total Suspended Solids (Plainwell Impoundment TCRA Design Report, 2007, Figure 5-2). Furthermore, based upon their physical/chemical characteristics, specifically very low water solubility and hydrophobic nature, PCBs will remain associated with solid particles which are measured both as TSS and turbidity. As such, turbidity provides a good surrogate for PCBs in surface water.

Three YSI 6920 Sonde units, each equipped with probes to measure dissolved oxygen, turbidity, pH, conductivity, and temperature will be used to collect the water quality data. The YSI 6920 logs the above data at predetermined time intervals. The units will be calibrated, operated, and maintained according to the manufacturer's instructions and will be capable of collecting point turbidity readings from water as deep as 15 feet. The meter(s) will be able to measure turbidity at a resolution of +/- 1 nephelometric turbidity unit (NTU). The Sonde units will be places within a perforated PVC pipe to protect the sensor and anchored to the creek bottom. A buoy will be attached to the PVC pipe to mark its location, and the sensor will be connected to a line anchored on shore for security purposes.

Turbidity data will be collected from upstream and downstream of the excavation area and from a location between the silt curtains surrounding the secondary retention area. The upstream and downstream locations will be 200 feet from the work area, along the general flow path to the work area, although the specific locations are subject to change based on field conditions. Turbidity readings will be collected from approximately mid-depth at all locations and will be downloaded from the YSI units twice per day with the data reviewed within 1 hour of downloading.

At a minimum, turbidity readings will be taken from the upstream and downstream locations at these times:

- prior to placement of any equipment or materials in a work area;
- following placement of equipment and materials but prior to excavation actions;
- every 1 hour during in-channel excavation actions; and
- other readings may be collected based on field conditions.

Turbidity readings will be taken from the secondary retention area sampling points at these times:

- every 1 hour while water is routed into the secondary retention area; and
- more frequently as dictated by conditions in the field.

Surface water PCB samples will be co-located with the turbidity monitoring locations 200 feet upstream and downstream of the excavation area. PCB samples will be collected in accordance with the procedures outlined in the Field Sampling Plan (FSP) for the site. Analysis will be performed by Weyerhaeuser Analytical Testing Services (WATS) in accordance with the site-specific Quality Assurance Project Plan (QAPP).

Surface water samples will be collected for PCB analysis on a weekly basis. Whenever possible, sampling will be conducted on the same day of the week and at approximately the same time during the day – samples will be taken approximately 2 hours after the start of excavation activities for the particular day. If abnormal events occur (such as noticeable sediment disturbances), additional samples will be taken for PCB analysis. Analysis will be requested on a 24 to 48 hour turnaround time after receipt of samples to allow changes to the operation if necessary.

During the residuals removal activities, visual inspections outside of the secondary retention area and excavation area isolation structures will be performed from a boat at the times described below. The inspections will assess the integrity of the silt curtains, looking for proper anchoring, positioning, and alignment, and for physical damage such as rips or tears. Results will be recorded in a field notebook. If a problem is found, work in that area will cease or flow into the secondary retention area will be diverted to the wastewater treatment system until the problem is corrected. Inspections will be performed at the following times:

- daily prior to the start of work;
- as required after major modifications or maintenance of the structure; and
- as required per turbidity exceedence corrective actions.

If the turbidity at the downstream monitoring location is more than two times the upstream turbidity, then a series of contingency actions will be undertaken until the turbidity has returned to acceptable levels. An exceedence at the secondary retention monitoring location will act as an early warning system and will prompt rerouting the excavation water to the wastewater treatment system. An exceedence at the downstream monitoring station will trigger the following actions to identify and eliminate the cause of the exceedence:

- Inspection of the area downstream of the excavation site and the turbidity curtains and Portadams surrounding the site.
- Next, troubleshooting measures will be implemented based on field conditions to reduce turbidity (*i.e.,* modifying the dewatering pump rate, cleaning or relocating the sump, etc.).
- Finally, excavation rates will be reduced or procedures modified until the turbidity has returned to acceptable levels.

Additional turbidity and PCB samples may be collected, as specified in this section, based on the extent or severity of the exceedence.

3.2 Wastewater Treatment System Discharge Monitoring

Wastewater will be generated during Emergency Response activities. This impacted water will be treated in an on-site wastewater treatment system (see Section 2.2.4 for system details). The wastewater treatment system will be monitored to ensure compliance with ARARs and to ensure that the treated water will not have a negative impact on the water quality in the Kalamazoo River. The discharge monitoring plan is also summarized in Table 3-1 at the end of this section.

The influent sampling point will be located just upstream of the sedimentation basin the intermediate stage sampling point will be located between the first and second granular activated carbon trains, and the effluent sampling point will be located just downstream of the effluent holding tank. The effluent from the sedimentation tank will be monitored to determine if tertiary treatment is necessary. If the turbidity of the overflow from the sedimentation tank is less than two times the river background turbidity, then the water will be routed to the holding tank and discharged through outfall 001. Otherwise the water will be sent for tertiary treatment consisting of fabric filtration followed by granular activated carbon adsorption. This effluent water will be sampled hourly during pumping operations. River background turbidity will be measured from the upstream turbidity monitoring location described in the resuspension monitoring section.

All of the samples will be collected and handled in accordance with the site FSP. Samples for PCBs, TSS, and total phosphorus as P will be sent to WATS for analysis following procedures documented in the approved QAPP. Additional sampling or inspections may be conducted based on conditions encountered in the field. Monitoring results will be documented in a field notebook and reported to the agency after the completion of the emergency response work.

3.3 Residuals Excavation Documentation Sampling

As required in the 12th Street Landfill ROD, residuals excavation will be complete when the visible contiguous residuals are removed from the excavation area in the former powerhouse channel. Continuous visual monitoring will be supplemented by residuals sampling to document post excavation PCB surface concentrations remaining in the powerhouse channel. Based on conditions in the field and the status of the remedial activities, intermediate samples may also be collected for expedited analysis in order to obtain data that will be used to improve excavation performance.

Documentation sampling will be conducted in a manner similar to the confirmation sampling being conducted under the Plainwell Impoundment TCRA. A grid will be established across the excavation area to facilitate the collection of a representative group of samples. The grid will be approximately 10,000 square feet in size and will be broken into 20-foot by 20-foot sampling sections. A minimum of six sample sections from the grid will be randomly selected for sampling using a random number generator/table or other approved means. The random pattern may be modified in the field (in consultation with oversight personnel) to ensure aerial distribution of the samples throughout the grided

zone. Once the sample nodes have been identified within each grid, confirmatory sampling will be performed. Each node will be sampled, visually inspected for the presence of residuals and, if no residuals are observed, sent for laboratory analysis to quantitatively confirm that excavation is complete. If residuals are observed in the samples, then additional sediment (targeting an initial 6-inch depth) will be excavated over the 20 foot by 20 foot sampling section. A confirmation sample will then be collected after the re-excavation is complete. Samples will be collected by hand using a trowel or similar tool as described in the FSP from the top 6 inches of the sediment surface. Samples will be analyzed at WATS following procedures documented in the QAPP.

3.4 Erosion Control and Vegetation Monitoring

Erosion control monitoring will include visual observations of the erosion protection system including rip rap and matting system, as well as evaluation of seeded and planted vegetation. Monitoring of restored bank areas for signs of detrimental erosion or bank failure will be performed annually until the long term operation and maintenance plan is implemented per the closure requirements for the 12th Street Landfill.

Monitoring activities will include conducting a visual inspection of bank conditions, developing written inspection logs, and photographing any conditions of note, including:

- loss of armoring materials (*i.e.,* loss of stones, erosion control matting, and/or vegetation);
- obvious signs of gullying or rill erosion;
- signs of bank undercutting or sloughing (*i.e.,* cracking or bulging visible at the surface);
- any obvious signs of lateral bank movement (*i.e.,* due to erosion or deposition); and
- any signs of stressed or minimal vegetation growth.

Observed conditions of note will be recorded in a monitoring inspection log and photographed at the time of inspection. If areas of significant erosion or bank failure are observed during the monitoring period, the need for adaptive management or bank repair activities will be discussed with the appropriate oversight agencies. Vegetation issues will be addressed with reseeding or mulching as necessary. Inspection logs and photographs will be provided to the USEPA and MDEQ for review and discussion within 1 month following completion of the monitoring event.

Table 3-1
Monitoring Plan

Parameter	Sample Type**	Location*	Minimum Frequency
Resuspension Monitoring and Control			
Turbidity	Instantaneous sample collection using hand held meter or auto sampler with resolution of +/- 1 NTU	Mid-depth, approximately 200 feet upstream of construction site/just downstream of the dam spillway along the general flow path going past the removal area; samples taken from a boat or pier	- At the beginning of the work day - Prior to and following equipment placement in the work area - Hourly while work is performed - As needed based on field conditions
		Mid-depth, approximately 200 feet downstream of construction site along the general flow path past the removal area; samples taken from a boat or pier	
		Water collection sump constructed within the removal area	- Hourly while pumps are discharging
		Mid-depth, between the inner and outer silt curtains surrounding the secondary retention area; samples take from a boat or pier	
PCBs	Grab sample, analyzed at off-site lab, quantification limit of 0.2 ug/L	Mid-depth, approximately 200 feet upstream (co located with turbidity sample); sample from boat or pier	- Once per week (on the same day where possible, 2 hours after the start of removal activities)
		Mid-depth, approximately 300 feet downstream (co-located with Turbidity sample); sample from boat or pier	
Inspections	Visual, looking for integrity and proper function	Entire Portadam structure and silt curtains surrounding the secondary retention area	- Daily prior to start of work - As required, after major modifications or maintenance of the structure - As required, per turbidity exceedence mitigation procedures.
Wastewater Treatment System Discharge Monitoring			
Flow	Record flow meter reading	Effluent to outfall 001	Daily
Total PCBs	Grab sample per EPA Method 608. Analyzed at off-site lab; quantification limit of 0.2 ug/L	Influent, Intermediate Stage and Effluent to Outfall 001	Twice per week (on the same day where possible, 2 hours after the start of removal activities)
TSS	Grab sample per EPA Method 160.2. Analyzed at off-site lab; quantification limit of 5 mg/L	Effluent to Outfall 001	Twice per week (on the same day where possible, 2 hours after the start of removal activities)
Total Phosphorus as P	Grab sample per EPA Method 365.3. Analyzed at off-site lab; quantification limit of 0.2 ug/L	Effluent to Outfall 001	Twice per week (on the same day where possible, 2 hours after the start of removal activities)
Turbidity	Instantaneous sample collection using hand held meter or auto sampler with resolution of +/- 1 NTU	Effluent from the sedimentation tank	Hourly while excavation dewatering water is being routed to the water treatment system.
Equipment Inspection	Visual; looking for equipment integrity and proper function	Entire system	Three times per week
Outfall Observation	Visual; looking for abnormal discharge (*i.e.*, color, clarity, etc)	Outfall 001	Daily (when WTP is operational)
Sediment Removal Confirmation Residual Excavation Documentation Sampling			
PCBs	Grab; analyzed at an off-site lab	Removal area divided into a gird; minimum of six locations randomly selected from the gird for sampling	After initial removal completion then after each successive removal pass until sample results are below 1 mg/kg or historic river bottom is reached.
Erosion Control and Vegetation Monitoring			
Inspections	Visual; looking for detrimental erosion or bank failure	Erosion protection along the 12th Street Landfill	Annually as part of the 12th Street Landfill inspections

* Locations are subject to change based on conditions encountered in the field

** See the FSP for specific sampling procedures and equipment.

Section 4
Project Schedule

This section provides details about the anticipated construction schedule, sequencing, and duration of each task of the project. Also refer to Figure 7 for the preliminary schedule, sequencing, and duration of specific work tasks anticipated for implementation of the emergency action activities at the 12th Street Landfill. Section 4.2 discusses important assumptions and potential constraints that may impact the actual timing and duration of construction and overall project implementation.

4.1 Summary of Construction Activities and Schedule

Construction activities are currently scheduled to take place between August and November 2007. Certain restoration activities, such as planting of seasonally dependent vegetation species, may need to occur in the spring of 2008. The construction activities are organized into five major categories summarized below. Section 2 and Figure 7 provides additional detail about the anticipated sequencing of individual work tasks.

- *Mobilization and Site preparation* – These activities will consist of constructing an access roads, installing temporary soil erosion and sedimentation control measures, clearing and grubbing along the Kalamazoo River, shaping of the landfill bank to facilitate access to the channel and construction of two containment pads on the top of the landfill (3 to 4 weeks).
- *Residual Removal* – These activities will consist of sectioning off and dewatering the former powerhouse channel, constructing a secondary water retention area, remove residuals from the channel and dewatering and disposal of the residuals within the containment pad (4 weeks).
- *Shoreline Construction* – These activities will consist of preparation of the shoreline and placement of clean fill material, a clay barrier zone, geotextile fabric, and erosion control materials consisting of rip rap and turf reinforcement mat (3 weeks).
- *Landfill Slope* – Activities will include reshaping the eastern slope of the landfill and placement of reinforcement mats and intermediate cover material. This task will also include covering of the containment pads to prevent any potential movement of the disposed material. Task also includes seeding and mulching as necessary (4 weeks).
- *Demobilization* – Activities include removal of all in water and shore equipment, any necessary repair of disturbed areas and demobilization of equipment (2 weeks).

Mobilization is scheduled to begin the week of August 6, 2007, with construction completed by the end of October/early November 2007.

4.2 Potential Impacts to Construction Schedule and Sequencing

The construction schedule summarized above and provided on Figure 7 was prepared assuming ideal circumstances and anticipated optimal sediment/soil removal rates. However, it is important to note that the schedule, sequencing, and duration of any one or more construction components may be affected by

inclement weather, high-flow events, technical adjustments to the design, confirmation sampling, and unforeseen agency requirements or other factors largely outside the control of the contractor and owner.

For example, a severe weather pattern could affect both work within the channel as well as the slope construction. In addition, restoration activities are subject to weather and seasonal conditions. Most plant species cannot be successfully planted or germinated late in the fall season, meaning some restoration and habitat reconstruction components may be delayed until the appropriate season or conditions. To manage these potential schedule impacts, an adaptive management approach will be employed to handle schedule modifications with the objective – but not an explicit guarantee – of completing the project by the end of 2007.

Specifically, and as shown on Figure 7, the project schedule has been based on an assumed construction start date of August 6, 2007, which will potentially allow enough time for completion of all construction tasks by late October 2007. Delays in the construction start date will adversely affect all other subsequent or dependent tasks in the sequence, and therefore could prevent the completion of construction activities by the end of the year.

As summarized in Section 3 (but not depicted on Figure 7), post-construction and long-term monitoring activities in the project area will continue for 3 years to confirm successful restoration measures and to monitor bank stability.

Section 5
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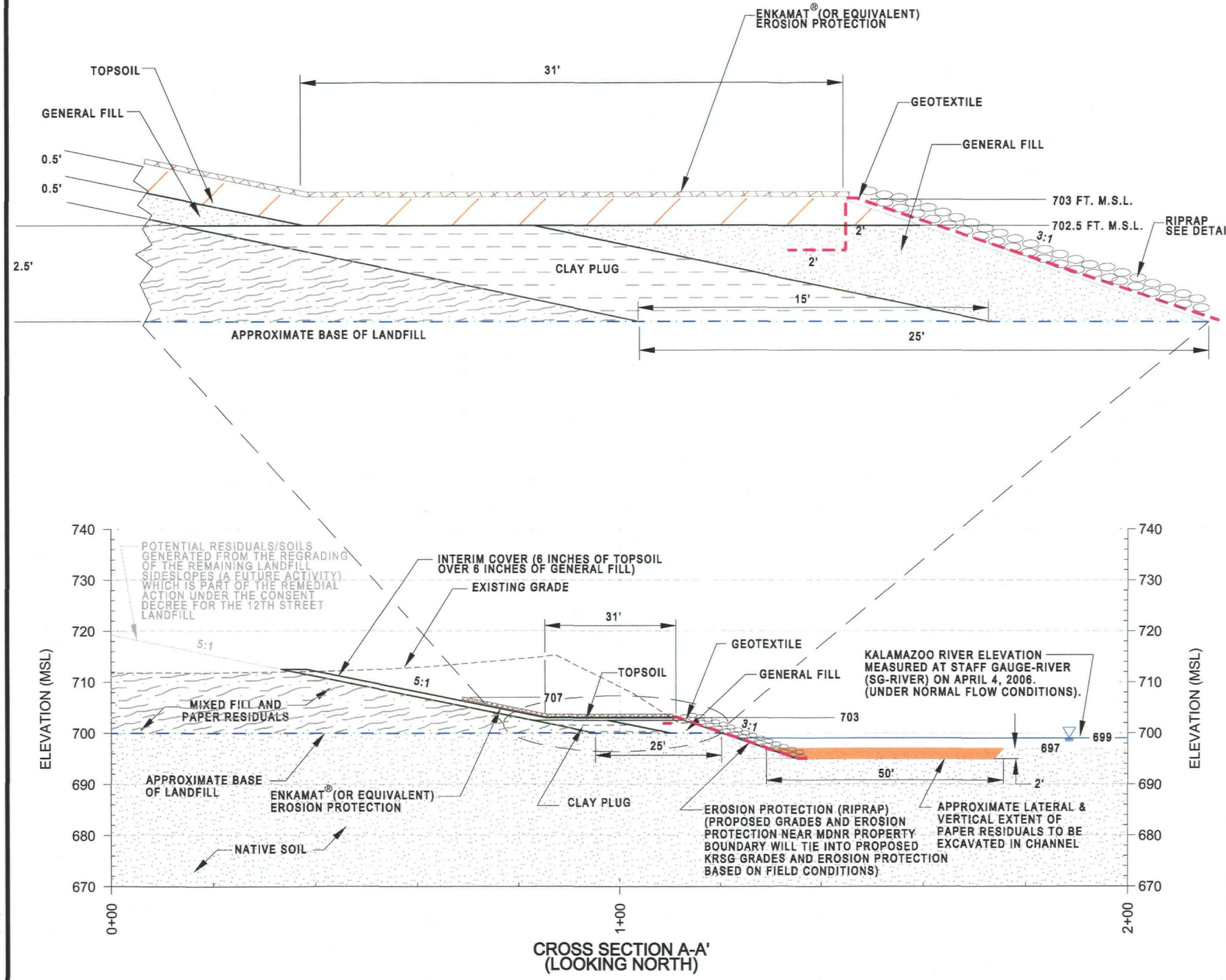
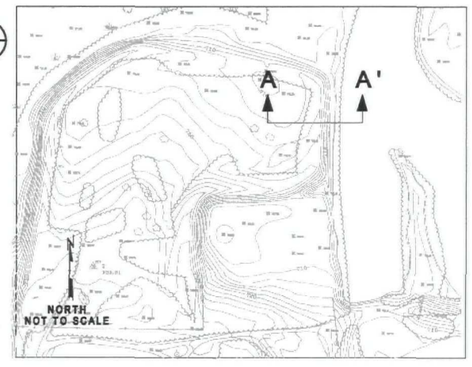
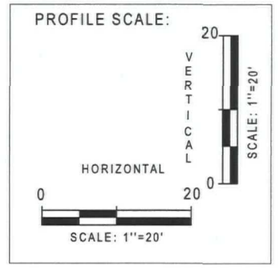


CROSS SECTION A-A'
(LOOKING NORTH)



CROSS SECTION LOCATOR



PROJECT: **12TH STREET LANDFILL**
EMERGENCY RESPONSE PLAN DESIGN REPORT
OTSEGO TOWNSHIP, MICHIGAN

SHEET TITLE: **CROSS SECTION A-A'**

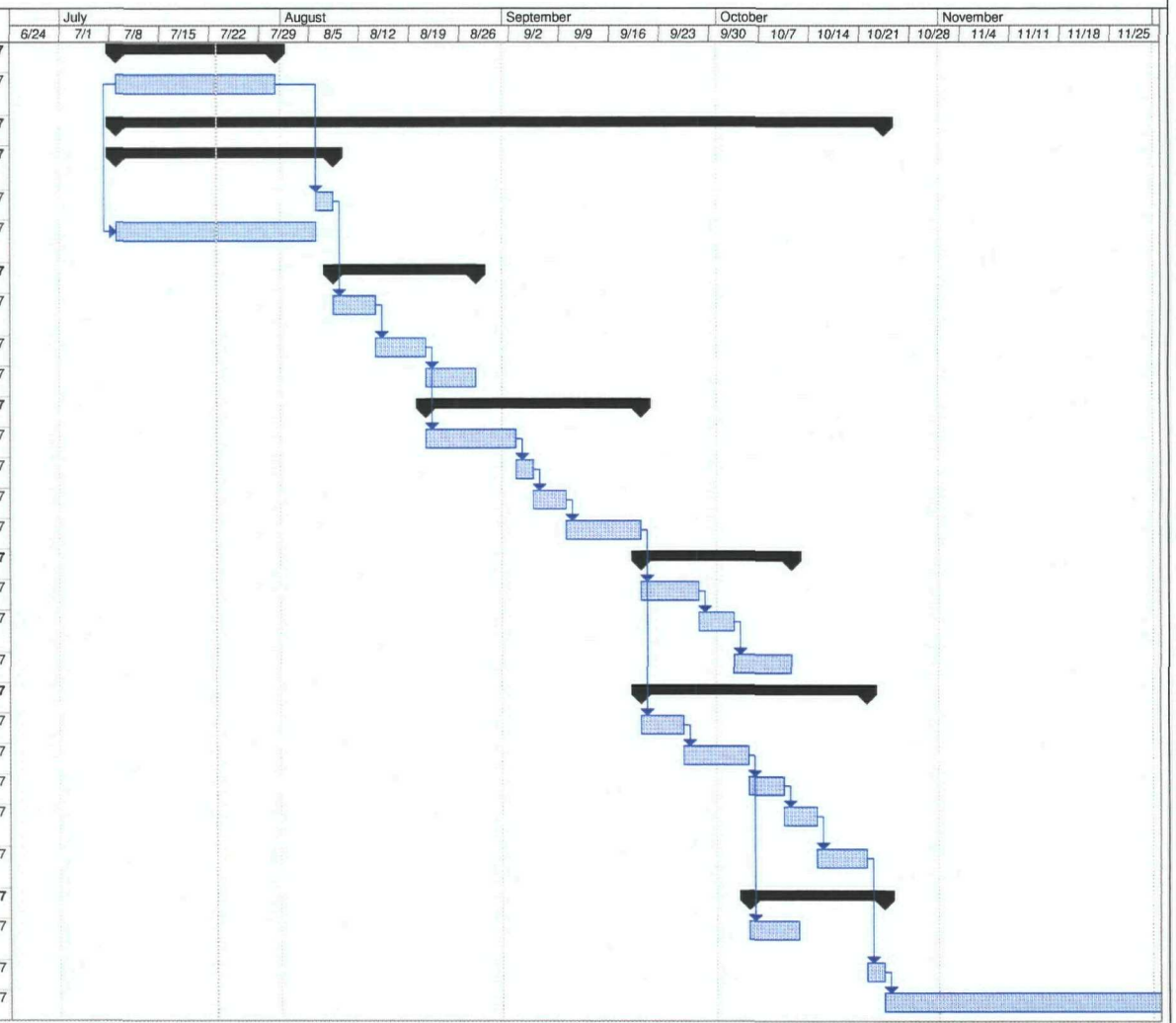
DRAWN BY: STORMERL	SCALE:	PROJ. NO. 5117.04\ERD
CHECKED BY: ECW	AS SHOWN	FILE NO. XSECTION_PLT.DWG
APPROVED BY: MJA	DATE PRINTED:	**FIGURE 4**
DATE: JULY 2007		

744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923 53708-8923
Phone: 608-831-4444
Fax: 608-831-3334

PLOT DATA
Drawing Name: J:\05117\04\ERD\xsection_plt.dwg
Operator Name: stormerl
Scale: 1"=1'

12th Street Landfill Former Powerhouse Channel Emergency Removal

ID	Task Name	Duration	Start	Finish
1	**Design**	**16 days**	**Mon 7/9/07**	**Tue 7/31/07**
2	Design Document with Construction Schedule	16 days	Mon 7/9/07	Tue 7/31/07
3	**Construction**	**77 days**	**Mon 7/9/07**	**Wed 10/24/07**
4	**Equipment Procurement and Mobilization**	**22 days**	**Mon 7/9/07**	**Wed 8/8/07**
5	Mobilize equipment	2 days	Mon 8/6/07	Wed 8/8/07
6	Procure water barrier and treatment eqpt	20 days	Mon 7/9/07	Mon 8/6/07
7	**Site Preparation**	**14 days**	**Wed 8/8/07**	**Tue 8/28/07**
8	Prepare sediment dewatering and slope soils pad on top of landfill	4 days	Wed 8/8/07	Tue 8/14/07
9	Clear, regrade, and bench slope and shoreline	5 days	Tue 8/14/07	Tue 8/21/07
10	Construct working platform	5 days	Tue 8/21/07	Tue 8/28/07
11	**Channel Sediment removal**	**22 days**	**Tue 8/21/07**	**Thu 9/20/07**
12	Water Barrier Installation	9 days	Tue 8/21/07	Mon 9/3/07
13	Set up water treatment system	2 days	Mon 9/3/07	Wed 9/5/07
14	Dewater Channel	3 days	Wed 9/5/07	Mon 9/10/07
15	Remove Sediment	8 days	Mon 9/10/07	Thu 9/20/07
16	**Shoreline construction**	**15 days**	**Thu 9/20/07**	**Thu 10/11/07**
17	Prepare areas and place fabric	6 days	Thu 9/20/07	Fri 9/28/07
18	Construct Clay plug and place intermediate cover on bench	3 days	Fri 9/28/07	Wed 10/3/07
19	Rip rap placemement	6 days	Wed 10/3/07	Thu 10/11/07
20	**Landfill Slope Prep and Erosion Control**	**22 days**	**Thu 9/20/07**	**Mon 10/22/07**
21	Cut Slope	4 days	Thu 9/20/07	Wed 9/26/07
22	Geomat/landscape placement	7 days	Wed 9/26/07	Fri 10/5/07
23	Place Topsoil, Seed and mulch	3 days	Fri 10/5/07	Wed 10/10/07
24	Place Willow Spikes within Rip Rap Area	3 days	Wed 10/10/07	Mon 10/15/07
25	Cover Dewatering pads - Grade site as needed	5 days	Mon 10/15/07	Mon 10/22/07
26	**Demobilization**	**13 days**	**Fri 10/5/07**	**Wed 10/24/07**
27	Remove Water Barriers and equipment from channel	5 days	Fri 10/5/07	Fri 10/12/07
28	Demobilize Equipment	2 days	Mon 10/22/07	Wed 10/24/07
29	Documentation	30 days	Wed 10/24/07	Wed 12/5/07



DRAFT
Revised Date: Mon 7/23/07

Task | Milestone | Rolled Up Task | Rolled Up Progress | External Tasks | Group By Summary
Progress | Summary | Rolled Up Milestone | Split | Project Summary

20 Landfill Slope Prep and Erosion Control
Sequencing of slope preparation will be dependent on field conditions and working areas adjacent to the channel

29 Documentation
Documentation includes limited sampling results, construction documentation, quantities etc..

Appendix A
Correspondence

Appendix B
Extent of Paper Residuals in Channel

Appendix C
Geotechnical Investigation Technical Memorandum

Appendix D
Permit Applications

U.S. COE/MDEQ Joint Permit Application

NPDES Permit Application

Appendix E
Slope Stability Calculations

Appendix F
Erosion Protection

Appendix G
Construction Quality Assurance (CQA)

744 Heartland Trail (53717-1934)
Madison, WI
Telephone (608) 831-4444
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Appendix G
Construction Quality Assurance (CQA) Plan

Emergency Response Plan Design Report
12th Street Landfill/Former Powerhouse Discharge Channel

Operable Unit No. 4 of the Allied Paper, Inc./
Portage Creek/Kalamazoo River Superfund Site

September 2007

Prepared for
Weyerhaeuser Company

Table of Contents

List of Tables

Section 1
Introduction

1.1 Project Background

This report presents the Construction Quality Assurance (CQA) Plan for the Emergency Action activities at the 12th Street Landfill. This CQA Plan has been prepared for, and is included in, the submittal of the Emergency Response Plan Design Report for the Weyerhaeuser 12th Street Landfill. This CQA Plan is intended to be a "working document," in other words, one that is updated to reflect changes in specific materials, in installation practices, industry standards, or in tests and test methods.

1.2 Purpose and Scope

The purpose of this CQA Plan is to address the quality assurance procedures and requirements for the emergency action construction at the 12th Street Landfill, including all earthen materials (clay, sand, aggregate, general soil, and topsoil) and synthetic materials (geotextile and erosion protection matting).

This CQA Plan provides procedures that will ensure that all of the landfill components are constructed in a manner that will maximize their performance requirements and that will safeguard components from damage during construction. The Plan procedures will also ensure that the landfill's temporary cover is constructed and documented in accordance with the design criteria and regulatory requirements.

The scope of this Plan includes general CQA requirements in regard to the roles, responsibilities, and qualifications of the parties involved; the preconstruction activities; and the general inspection and documentation procedures. Specifically, this CQA Plan establishes requirements for construction procedures and observation, field and laboratory testing frequencies and methods, and acceptance criteria for each component of the project. Testing and acceptance criteria are based on Part 115, of Act 451 of the Michigan Department of Environmental Quality Waste and Hazardous Materials Division requirements, where applicable.

The CQA Plan addresses the construction activities of the following systems:

- erosion protection system;
- access and maintenance roads; and
- temporary landfill cover.

The following sources were used in the development of this plan:

- Part 115, of Act 451 of the Michigan Department of Environmental Quality Waste and Hazardous Materials Division

- Guidebook of Best Management Practices for Michigan Watersheds, October 1998
- Record of Decision (ROD) 12th Street Landfill (Operable Unit #4 of the Kalamazoo River Superfund Site, 2001
- American Society of Testing Materials, Annual Book of ASTM Standards, 2006

1.3 Quality Assurance and Quality Control

Quality assurance and quality control are defined as follows:

- ***Quality assurance*** - A planned and systematic pattern of all means and actions designed to provide adequate confidence that materials or services meet contractual and regulatory requirements. This is typically performed to assure the purchaser, owner, and/or regulatory agencies that delivered materials or services are of desired quality.
- ***Quality control*** - Those actions that provide a means to measure and regulate the characteristics of a material or service to meet contractual and regulatory requirements. This typically is performed by, or for, the provider of materials or services as a control mechanism on the quality of the provider's efforts.

In the context of this CQA Plan, the terms are further defined as follows:

- ***Quality assurance*** refers to the means and actions employed by the CQA Officer to ensure conformity of the systems' installation with the CQA Plan and the Construction Plans and Specifications. Quality assurance is primarily provided by an independent third party (consultant or laboratory) under the oversight of the CQA Officer.
- ***Quality control*** refers to those actions taken by the Manufacturer, Fabricator, or Contractor/Installer to provide materials and workmanship that meet the requirements of the CQA Plan and the Construction Plans and Specifications. Some testing efforts required by this CQA Plan may serve as both quality control and quality assurance measures.

1.4 General Testing Requirements

This CQA Plan includes references to test procedures of the American Society of Testing and Materials (ASTM). Test procedure references are always to the latest approved version up to the date of this document, unless specifically stated otherwise in this document.

Tests will be performed in strict accordance with the referenced test procedure and the description included in this Plan, unless otherwise indicated. Any deviations to test procedures called out in this Plan must be approved, in writing, by the CQA Officer prior to commencement of any work.

Section 2
CQA Roles, Responsibilities, and Qualifications

2.1 CQA Officer

The CQA Officer will supervise and be responsible for all observation, testing, and related construction documentation as described in this CQA Plan. The CQA Officer will be responsible for preparing the documentation report to certify substantial compliance with appropriate sections of Part 115, of Act 451 of the Michigan Department of Environmental Quality Waste and Hazardous Materials Division. The CQA Officer will be a Professional Engineer registered in the State of Michigan.

The CQA Officer may delegate daily observation and documentation, testing, and sampling duties to a qualified technician or engineer with experience in the assigned aspect of construction who will serve as the Resident Project Representative (RPR). Although these duties may be delegated, the CQA Officer will retain the responsibility for these activities.

2.2 Resident Project Representative (RPR)

The RPR will carry out daily observation, testing, and sampling duties under the direct supervision of the CQA Officer. The RPR will be a qualified technician or engineer with experience in the assigned aspect of construction. The RPR will observe and document construction and installation procedures. The RPR will prepare daily summary reports and will routinely transmit these to the CQA Officer. The RPR will immediately notify the CQA Officer of problems or deviations from the CQA Plan or construction plans and specifications. Reporting, documentation, and resolution of problems and deficiencies will be carried out as described in Section 4. The RPR will not have authority to approve design or specification changes without the consent of the CQA Officer.

2.3 Soil Testing Laboratory

The Soil Testing Laboratory retained will be experienced in landfill construction soil testing, the American Society of Testing and Materials Standards (ASTM), and other applicable standards. The selected laboratory will be required to be responsive to the project needs by providing test results within reasonable time frames. This will include providing verbal communication on the status of ongoing tests and immediate communication of test results as needed to facilitate ongoing construction. Such information may include hydraulic conductivity test data, maximum dry density and optimum moisture content values, and borrow source characterization data. Final laboratory reports will be certified by the soil testing laboratory and submitted to the CQA Officer.

2.4 Construction Contractor

The Construction Contractor's role will be to furnish earthwork and construction, and to provide overall construction responsibility for the completion of the project. The term "Contractor" is used interchangeably with "Construction Contractor" in this Plan.

Section 3
Preconstruction Activities

3.1 Preconstruction Meeting

Prior to commencement of each phase of construction, a preconstruction meeting will be held. This meeting will include the parties involved in the construction, including the CQA Officer or designated representative, the RPR, the Construction Contractor, and potentially the Owner.

The purpose of this meeting is to begin the planning and coordination of construction tasks; to identify potential problems that might cause difficulties and delays in construction; to properly interpret the design intent by the Contractor(s); and to present the CQA Plan to all of the parties involved. It is important that the rules regarding testing, repairs, etc. be known and accepted by each party to this Plan.

Specific activities considered for this meeting include the following:

- Review the project Health and Safety Plan
- Review critical design details of the project, including the plans and specifications.
- Review measures for surface water runoff and runon diversion control, including sump locations, siltation control, and pumping requirements.
- Make appropriate modifications to the Construction Quality Assurance Plan, and develop project-specific addendums (if necessary).
- Review the responsibilities of each party.
- Review lines of authority and communication.
- Review methods for documenting and reporting, and for distributing documents and reports.
- Review requirements of the soil testing laboratory regarding sample sizes, methods of collection, and shipment. Also, review turntimes for sample data and their implications on the construction schedule, pending receipt of acceptance data.
- Review the number and locations of the tests required for soil components.
- Review precautions to be taken to maximize bonding between lifts of compacted clay.
- Review the method for splicing segments of the compacted clay plug.
- Review precautions to be taken to minimize desiccation cracking of clay surfaces.
- Review the time schedule for all operations.
- Observe where the site survey benchmarks are located, and review methods for maintaining vertical and horizontal control.
- Review permit documentation requirements.

- Review the survey documentation tables and plans that identify the locations where survey documentation information is required.
- Conduct a site walk-around to review material storage locations and general conditions relative to construction.
- Set up a time and place for regular construction progress meetings.

The meeting will be documented by the RPR or CQA Officer, and minutes will be distributed to all parties involved in the construction project.

Section 4
General Construction Observation and Documentation

This section describes the general documentation procedures to be implemented, including the use of forms, the identification and resolution of problems or deficiencies, and photographic documentation.

4.1 Progress Meetings

Progress meetings will be held regularly at the work area. At a minimum, the meeting will be attended by field supervisory and CQA personnel. The purposes of the meeting are as follows:

- Review Health and Safety issues associated with any upcoming activities or changes in work conditions.
- Review the work activity since the last progress meeting.
- Discuss the Contractor's personnel and equipment assignments.
- Review the work schedule.
- Discuss possible problems.
- Review any new test data.
- Review data documentation requirements.

The meetings will be documented by a person designated at the beginning of the meeting, and minutes will be transmitted to all appropriate parties involved in the construction project.

4.2 Daily Reports

A daily summary report will be prepared by the CQA Officer, or the RPR under direct supervision of the CQA Officer, for each day of activity and will include the following information:

- The date, project name, location, report preparer's name, and the names of representatives on-site performing CQA under the supervision of the CQA Officer
- The time work starts and ends each construction work day, along with the duration and reason for work stoppages (*i.e.*, weather delay, equipment shortage, labor shortage, unanticipated conditions encountered, etc.)
- Data on weather conditions, including temperature, humidity, wind speed and direction, cloud cover, and precipitation
- The construction contractor's work force, equipment in use, and materials delivered to, or removed from, the job site
- A chronological description of work in progress, including locations and type of work performed

- A summary of meetings held and a list of those in attendance
- A description of materials used and references or results of testing and documentation
- A discussion of problems/deficiencies identified and corrective actions taken as described in Subsection 4.4 (Problem/Deficiency Identification and Corrective Action)
- Identification/List of laboratory samples collected, marked, and delivered to laboratories, or clear reference to the document containing such information
- An accurate record of calibrations, recalibrations, or standardizations performed on field testing equipment, including actions taken as a result of recalibrations, plus the results of other data recording

Field data sheets containing the following information, as necessary, will be prepared daily by each representative:

- Test or sample location and elevation
- Type of documentation (*i.e.*, field moisture/density test, etc.)
- Procedures used
- Test data (*i.e.*, Proctor value, etc.)
- Results
- Names of personnel involved in the documentation and sampling activities
- Signature of the person performing the documentation

4.3 Forms, Checklists, and Data Sheets

Additional forms may be developed during the course of the project to provide specific needs, or simply to improve the efficiency of data collection. New forms will be approved by the CQA Officer prior to their use.

4.4 Problem/Deficiency Identification and Corrective Action

Problem and/or deficiency identification and corrective action will be documented in the daily report when a construction material or activity is observed or tested that does not meet the requirements set forth in this Plan. The daily report should clearly reference other reports, photographs, or forms that contain data or observations leading to the determination of a problem or deficiency. Problem and/or deficiency identification and corrective action documentation may include the following information:

- A description of the problem or deficiency, including reference to supplemental data or observations responsible for determining the problem or deficiency.
- The location of the problem or deficiency, including how and when the problem or deficiency was discovered, and an estimate of how long the problem or deficiency has existed.
- An opinion as to the probable cause of the problem or deficiency.

- A recommended corrective action for resolving the problem or deficiency. If the corrective action has already been implemented, then the observations and documentation to show that the problem or deficiency has been resolved should be included. If the problem or deficiency has not been resolved by the end of the day upon which it was discovered, then the report will clearly state that it is an unresolved problem or deficiency. Subsequent daily reports will indicate the status of problems or deficiencies until they are resolved.

If the problem or deficiency has not been resolved, then the CQA Officer and the RPR will discuss the necessary corrective actions. The CQA Officer will work with the Owner and Construction Contractor to implement actions as necessary to resolve the problem or deficiency. A description of such problems or deficiencies and the corrective actions implemented will be provided in the Construction Documentation Report.

The CQA Officer, working with the Owner and Construction Contractor, will determine if the problem or deficiency is an indication of a situation that might require changes to the Plans and Specifications and/or the CQA Plan. Revisions to the Plans or Specifications or the CQA Plan must be approved by the CQA Officer and the Owner after consultation with the USEPA. Documentation of the USEPA's concurrence and/or conditions regarding proposed changes will be incorporated into the Construction Documentation Report.

4.5 Photographic Documentation

Photographs will be taken to document observations, problems, deficiencies, corrective actions, and work in progress. Photographs will be in 35-mm slide or print format or digital and will be filed in chronological order in a permanent protective file by the CQA Officer or the RPR.

The following information will be documented in the daily report or a log book for each photograph:

- Date and time
- Information regarding the orientation of the photograph itself for proper viewing (*i.e.*, "looking south")
- Description of the subject matter
- Unique identifying number for reference in reports

4.6 Surveying

Documentation surveying requirements for each component of the project are described in their respective report sections. Required surveying will be performed by personnel experienced in construction surveying under the supervision of the CQA Officer. Surveys will be based on survey control points previously established at the site. Elevations will be based on mean sea level (M.S.L.) datum, and coordinates will be based on the site-specific horizontal control. The location of field tests and samples will be recorded. Generally, these locations can be determined by reference to nearby construction stakes or markings; however, if such convenient reference is not readily available, the CQA Officer or the designated RPR will be responsible for providing or requesting survey control.

Section 5
Compacted Select Clay Fill

5.1 General

This section includes the quality assurance requirements for the placement, backfilling, and compaction of select clay fill. Compacted select clay fill will be used in the following manner:

- Constructing the clay plug

The select clay fill will be obtained from an off-site source.

All field tests, soil sample types, and survey measurements will be recorded in the daily construction reports (see Subsection 4.2) as record construction data, including locations (by coordinates) and elevations of all field tests and laboratory sample points.

5.2 Procedures and Observation

The RPR will observe compacted select clay fill construction activities and will document relevant observations to support certification of the following requirements:

- The RPR will confirm the uniformity of the excavated soil to be used as select clay fill. Soil placement will be monitored for segregation and removal of unsuitable material and for changes in soil type, color, texture, and moisture content.
- The Construction Contractor will segregate and/or remove unsuitable materials such as granular soil, silty or sandy clay not meeting acceptance criteria, boulders, cobbles, and organic material.
- The RPR will observe clay placement and will measure field densities and moisture contents, using methods described in Subsection 5.3 (Sampling Requirements and Acceptance Criteria), to document that the compacted clay plug is in substantial conformance with the placement specifications and that soil placement has been conducted in a manner to achieve a uniform, homogeneous clay mass.
- Voids created by nuclear density gauge (NDG) probes or as the result of Shelby tube samples will be backfilled with granular bentonite.
- Areas of unacceptable permeability, density, or moisture content, as defined by Subsection 5.3 (Sampling Requirements and Acceptance Criteria), will be documented by the RPR. Corrective action will consist of moisture-conditioning of the soil and/or additional compactive effort as necessary. Methods for moisture-conditioning soil are described below. Following corrective actions, such areas will be retested.
- If necessary, surfaces of the clay plug to receive successive lifts of clay will be moisture-conditioned either by scarification and addition of water where desiccated, or by discing and air drying where saturated to promote effective bonding of lifts. Following scarification, water will be applied with a spray bar applicator or equivalent method to achieve uniform distribution.

- No frozen soil will be used for select clay fill construction. Frozen soil in the compaction work area will be removed.
- Stones and other penetrating objects 2 inches or larger protruding from the surface of the final lift of compacted select clay fill will be removed. The RPR will observe this process and will document the removal of stones and other objects by the Contractor. Voids made by the removal of stones will be filled with clay soil or bentonite.
- Preconstruction planning will be undertaken to sequence construction activities to minimize the length of time any completed clay surface will be exposed prior to receiving protective cover. Protective cover will be provided by installing the 6-inch–thick topsoil layer over the clay.

5.3 Sampling Requirements and Acceptance Criteria

Field and laboratory sampling frequencies are based on the area or volume of material placed. This section describes the required analyses, methods, sample frequencies, and acceptance limits. The RPR will perform field tests and will collect soil samples for laboratory analysis.

5.3.1 Field Testing

The following field testing methods will be used by the RPR during construction:

PARAMETER	METHOD
Soil density and moisture content	ASTM D6938

Field density and moisture content tests will be performed at a frequency of one test per acre, and a minimum of three tests per day or lift of select clay fill. The testing pattern will be offset on alternate lifts.

Field Testing Acceptance Criteria

Acceptance criteria for field density will require soil compaction to a minimum of 90 percent of the Modified Proctor (ASTM D1557) maximum dry density, or a minimum of 95 percent of the Standard Proctor (ASTM D698) maximum dry density. Moisture content requirements will be at least 2 percent wet of optimum if using the Modified Proctor, and at least wet of optimum if using the Standard Proctor. The acceptable range will be based on Proctor moisture-density relationships and compaction versus permeability relationships.

5.3.2 Laboratory Testing

Routine laboratory testing of the clay soil will be performed on samples from the clay borrow area and on the in-place clay soil samples collected by the RPR. Samples for determining in-place properties will be collected by pushing Shelby tubes. Soil characteristics will be determined from representative samples and from Shelby tube samples.

Undisturbed Sample Analysis

One undisturbed sample will be taken at a frequency of one per every 10,000 cubic yards of clay to be placed or a minimum of three tests and will be submitted to the Soil Testing Laboratory.

The undisturbed samples will be analyzed for hydraulic conductivity as follows:

PARAMETER	TEST METHOD
Hydraulic conductivity	ASTM D5084 or SW 846 EPA Method 9100

Representative Sample Analysis

Representative (grab) samples will be obtained on the basis of three criteria. First, an initial sample will be obtained from the clay borrow source and analyzed prior to construction. This will confirm soil characteristics and provide an initial maximum dry density and optimum moisture content for field moisture/density testing. Second, routine samples will be obtained for every 5,000 cubic yards placed. Third, in the event that changes in physical appearance or soil characteristics are observed, a sample will be obtained and analyzed. The maximum dry density and optimum moisture content values used for compaction testing may be adjusted during the course of construction based on the results of the above sampling.

The following laboratory analyses will be performed on all representative samples obtained:

PARAMETER	TEST METHOD
Moisture-density relationship using Modified/Standard Proctor compaction	ASTM D1557 [a, b]/ ASTM D698 [a, b]
USCS classification	ASTM D2487

Notes:

[a] Five-point Proctor analysis required for first and second sampling criteria.

[b] A one-point Proctor analysis may be utilized for representative samples collected for the third sampling criterion (apparent changes in soil quality) to verify applicability of previously analyzed moisture-density relationships. If the result does not verify applicability, then a five-point analysis will be performed in accordance with the first sampling criterion.

Laboratory Testing Acceptance Criteria

The following acceptance criteria will apply to the compacted select clay fill.

- A classification of SC, CH, CL, CL/ML, or ML
- A saturated hydraulic conductivity of 1 x 10^{-7} cm/s or less, when compacted to 90 percent Modified or 95 percent Standard Proctor density

5.4 Thickness Documentation

The top of the clay plug grades will be surveyed at key locations every 50 feet along the eastern side of the landfill. Key locations include breaks in grade, toes of slopes, and tops of slopes. The clay plug thickness will be determined at surveyed locations and reported in a tabular fashion. The minimum acceptable clay plug thickness will be 2.5 feet (+ 0.1 foot).

Section 6
General Soil

6.1 General

This section includes the quality assurance requirements for the placement, compaction, and grading of general soil (i.e., general fill). General soil may be any inorganic soil except rock. General soil will be used in the construction of the following landfill components:

- Temporary landfill cover
- Access roads

All field tests, soil sample types, and survey measurements will be recorded in the daily summary reports (see Subsection 4.2) as record construction data, including locations (by coordinates) and elevations of all field tests and laboratory sample points.

6.2 Procedures and Observation

The RPR will observe general soil placement activities and will document relevant observations to support certification of the following requirements:

- The RPR will periodically observe loads of general fill for general conformance to material specifications and may randomly sample loads. The RPR will perform routine conformance sampling as defined in Subsection 6.3.2.
- No frozen soil will be used for backfilling. Any frozen soil in the compaction work area will be removed.
- Loose lift thickness for general soil compaction will not exceed 18 inches.
- General soil used as structural fill (*i.e.*, subbase preparation, and roads) will be compacted to a minimum of 90 percent or 95 percent of the maximum dry density as determined by the Modified or Standard Proctor test, respectively.
- Unacceptable compaction density, as defined above, will be reported to the CQA Officer by the RPR. Corrective action will consist of moisture-conditioning of the soil and/or additional compactive effort as necessary.

Field densities using methods described in Subsection 6.3.1 will be measured to document that the in-place soil is in substantial conformance with the required density.

6.3 Sampling Requirements and Acceptance Criteria

No field or laboratory testing of general soil will be required for placement of the temporary landfill cover.

6.3.1 Field Testing

The following field testing method will be used by the RPR during construction:

PARAMETER	TEST METHOD
Soil density	ASTM D6938

The RPR will conduct a minimum of four field density tests on the general fill material placed to construct the access road. A nuclear density gauge will be used for field density determination.

6.3.2 Laboratory Testing

Routine laboratory testing of the general soil will be performed on samples from the general soil borrow area or stockpile. The following laboratory test method will be performed by the Soil Testing Laboratory on samples collected by the RPR:

PARAMETER	TEST METHOD
Moisture/Density using Modified or Standard Proctor compaction	ASTM D1557 or ASTM D698

Samples of the borrow area or stockpiled soil will be collected by the RPR prior to the use of the material and whenever physical appearance or other changes are noticeable. These samples will be submitted to the Soil Testing Laboratory for the above testing.

6.4 Thickness Documentation

The top of the access road along the river will be surveyed at key locations every 50 feet along the eastern side of the landfill. Key locations include breaks in grade, toes of slope, and tops-of-slopes. The minimum acceptable access road thickness along the river is 2.5 feet (+ 0.1 foot).

The subgrade and top of the temporary landfill cover will be surveyed on the same 50-foot grid, and at other key locations. Key locations include breaks in grade. The minimum acceptable thickness will be 1 foot (+ 0.1 foot).

Section 7
Granular Soil

7.1 General

Granular soil includes select granular fill. Select granular fill refers to material used for the paper residuals/river sediment dewatering pad drainage layer.

7.2 Procedures and Observation

The RPR will observe granular soil placement activities and will document relevant observations to support certification of the following requirements:

- The RPR will periodically observe loads of granular soil for general conformance to material specifications and may randomly sample loads.
- If granular soil is stockpiled on-site prior to use, measures will be taken to minimize contamination by fines such as wind-blown particles and surface soil during loading operations.

7.3 Sampling Requirements and Acceptance Criteria

Field sampling and laboratory testing frequencies are based on proportionate sampling of construction areas or volumes of material placed as specified by Part 115, of Act 451 of the Michigan Department of Environmental Quality Waste and Hazardous Materials Division. This section describes the required analyses, methods, sampling frequencies, and acceptance limits. The RPR will collect soil samples for laboratory analysis.

7.3.1 Field Testing

No field testing will be required for select granular fill. However, as stated in Subsection 7.2 above, the RPR will perform a visual inspection of this soil for conformance to material specifications and may randomly sample deliveries.

7.3.2 Laboratory Testing

Representative (grab) samples will be obtained from the proposed select granular fill sources prior to delivery of the material. The source sampling frequency will be dependent on the apparent uniformity of the source and must be approved by the CQA Officer.

Grab samples of granular material placed will be collected and analyzed as follows:

SOIL TYPE	FREQUENCY	PARAMETER	TEST METHOD
Select granular fill	1/1,000 CY[a]	Grain size	ASTM D422[b]
Select granular fill	1/2,500 CY[c]	Remolded hydraulic conductivity	ASTM D2434

Notes:
[a] For lesser volumes, a minimum of four samples will be tested.
[b] Testing is required only to the #200 sieve.
[c] For lesser volumes, a minimum of two samples will be tested.

Laboratory Testing Acceptance Criteria

Select granular fill material will contain no more than 5 percent by weight of fines passing the #200 sieve, will have a uniformity coefficient of less than 4 for gravelly soil and less than 6 for sandy soil, and will have a remolded hydraulic conductivity of 1×10^{-3} cm/s or greater at the anticipated field density.

7.4 Thickness Documentation

The thickness of the select granular fill for the paper residuals/river sediment dewatering pad drainage layer will be documented on a 100-foot grid by hand-shoveling and measuring the observed thickness.

Section 8
Topsoil

8.1 General

This section includes the quality assurance requirements for the excavation and placement of the topsoil and for the seeding, fertilization, mulching, and watering of the topsoil layer for vegetation. Topsoil will be obtained from on-site stockpiles created by the clearing of the landfill cover and associated disturbed perimeter areas.

8.2 Procedures and Observation

Work covered by this section will be performed in accordance with the Construction Plans and Specifications. The RPR will observe topsoil placement activities and will document relevant observations to support certification of the following requirements:

- The RPR will confirm the source and uniformity of topsoil used. Soil excavation and placement will be monitored for minimization of inorganic soil not compatible for establishment of vegetation.
- Prior to seeding, the topsoil will be worked to prepare a suitable seedbed.
- Seeding, fertilizing, and mulching will be performed in a timely manner.

8.3 Sampling Requirements and Acceptance Criteria

The topsoil will be suitable for the establishment and long-term maintenance of the selected vegetation seed mix with appropriate fertilization. At the RPR's discretion, samples may be collected for laboratory testing.

Seeding

The following seed mixture will be used:

■ Creeping red fescue	20 lbs
■ Kentucky bluegrass	5 lbs
■ Redtop	1 lb
■ Tall fescue	20 lbs
■ Timothy	2 lbs
■ Birdsroot trefoil	10 lbs
■ Ryegrass	5 lbs
■ Total	63 lbs per 1,000 square feet

- Apply seed at a rate of 63 pounds per 1,000 square feet evenly in two intersecting directions. Rake in lightly.
- Planting season: April 1 to May 20 and September 1 to October 5.
- Do not sow (sow-to scatter seed over (land, earth, etc.) for the purpose of growth) immediately following rain, or when ground is too dry, or during windy periods.

Fertilization

- Fertilizer will only be added if needed with type and amount approved by owner and any necessary regulatory agency.

Mulching

- Apply mulch to the seeded at a rate of 2 to 3 tons per acre.
- Immediately following mulching, roll mulched area. On large areas, a cultipacker may be used to roll and cover the seed.

Hydroseeding

- A hydroseeder may be used if deemed more appropriate for seeding, particularly for slopes. If used, the hydroseeder shall have continuous agitating action that keeps the seed uniformly mixed in the slurry until pumped from the tank.
- Apply seed slurry at a rate per the manufacture's recommendations in two intersecting directions, with a hydraulic seeder. If no rates are given, use 150 to 200 lbs/acre. Do not hydroseed area in excess of that which can be mulched on the same day.

8.4 Surveying

The thickness of topsoil placement will be documented on a 50-foot grid by surveying or by hand-shoveling and measuring the observed thickness of topsoil.

Section 9
Riprap

9.1 General

This section includes the quality assurance requirements for the placement of riprap for erosion protection along the riverbank.

9.2 Procedures and Observation

The RPR will observe riprap placement activities and will document relevant observations. The RPR will periodically observe loads of riprap for general conformance to material specifications.

9.3 Sampling Requirements and Acceptance Criteria

This section describes the required analyses, methods, sampling frequencies, and acceptance limits.

9.3.1 Field Testing

No field testing will be required for riprap. However, as stated in Subsection 9.2 above, the RPR will perform a visual inspection of this material for conformance to material specifications.

9.3.2 Laboratory Testing

The riprap will have a D_{50} of approximately 9 inches and will be angular in shape. No stones will be less than 3 inches in diameter, and no stones will be greater than 15 inches in diameter. An alternative locally available riprap may be used as approved by the Engineer.

9.4 Thickness Documentation

The top of the riprap will be surveyed every 50 feet along the eastern side of the landfill at the same locations surveyed for the subbase grades. The riprap thickness will be determined at surveyed locations and reported in a tabular fashion. The minimum acceptable thickness will be 2 feet.

Section 10
Geotextile

10.1 General

This section of the CQA Plan applies to nonwoven geotextile used underneath the riprap along the riverbank.

This section is divided into three major subheadings, which cover the quality assurance requirements for preinstallation (which includes Geotextile Manufacturers), installation, and post-installation (which includes the final examination of the geotextiles prior to placing the appropriate material above the geotextile). The terms preinstallation, installation, and post-installation are applicable only to the geotextile and do not apply to the overall construction of the landfill facility.

10.2 Preinstallation

10.2.1 Manufacturing

The geotextile will be supplied to the site in factory rolls. Prior to the delivery of any geotextile rolls to the site, the Geotextile Manufacturer will provide the CQA Officer with the Manufacturer's Quality Control Plan used for production of the geotextile rolls.

Every roll of geotextile for delivery to the site will be manufactured and inspected by the Geotextile Manufacturer, according to the following requirements:

- The geotextile must be free of holes and any other sign of contamination by foreign matter.

The Geotextile Manufacturer will provide certification, based on tests performed in accordance with the methods listed in Table 10-1 that the geotextile supplied under this Plan will meet the material specifications listed in Table 10-2. These tests may be performed by the Geotextile Manufacturer's laboratory or a laboratory contracted by the manufacturer. Additionally, the Geotextile Manufacturer will provide certification that the Manufacturer's Quality Control Plan was fully implemented for the geotextile materials supplied under this Plan. The Geotextile Manufacturer will provide documentation to verify the results of the Manufacturer's CQA Plan implementation if required by the CQA Officer.

Table 10-1
Geotextile Tests and Test Methods

PROPERTY	TEST METHODS
Apparent opening size [1]	ASTM D4751
Grab tensile properties Tensile strength Break elongation	ASTM D4632
Permittivity [1]	ASTM D4491
Permeability	ASTM D4491
Puncture resistance	ASTM D4833
CBR puncture strength	ASTM D6241
Trapezoidal tear	ASTM D4533
Mullen burst	ASTM D3786
Flow rate	ASTM D4491
UV resistance (500 hours)	ASTM D4355

Notes:
[1] Testing required only for geotextile separator filter.

Table 10-2
Geotextile Filter Acceptance Criteria

PROPERTY	UNITS	TYPE OF CRITERION	ACCEPTABLE VALUE [1]
Apparent opening size	mm	Maximum	0.180
Grab tensile properties[2] Tensile strength Break elongation	 lb %	 Minimum Minimum	 205 50
Permittivity	sec^{-1}	Minimum	1.2
Permeability	cm/sec	Minimum	0.21
Puncture resistance	lb	Minimum	130
CBR puncture strength	lb	Minimum	500
Trapezoidal tear[2]	lb	Minimum	80
Mullen burst	psi	Minimum	380
Flow rate	$gal/min/ft^2$	Minimum	95
UV resistance (500 hours)	% strength retained	Minimum	70

Notes:
(1) Values are based on discussions with acceptable manufacturers and represent production values at the time this document was prepared. Minimum values are based on two standard deviations from average production values.
(2) These tests will be performed and results reported in both the machine and cross directions.

The geotextile rolls will be tested and evaluated prior to acceptance. The CQA Officer may perform/require additional testing (*i.e.*, conformance testing) as required by detailed specifications or as required in the judgment of the CQA Officer to verify that the geotextile meets the specifications.

10.2.2 Delivery, Handling, and Storage of Geotextile Rolls

Each geotextile roll to be used at the landfill facility will be marked by the Geotextile Manufacturer with the following information and in the following manner:

- When fabric is rolled on a core, each roll will be identified with a durable gummed label, or an equivalent, on the inside of the core and on the outside of the protective wrapping for the roll.
- Each roll label will contain the following information at a minimum:
  - Name of manufacturer (or supplier)
  - Style and type number
  - Roll length and width
  - Batch (or lot) number

- Nominal product thickness
- Date of manufacture
- Roll number

The Geotextile Manufacturer will use the following guidelines in packaging, wrapping, and preparing all geotextile rolls for shipment:

- When cores are required, those that have a crushing strength sufficient to avoid collapse or other damage while in use will be used.
- Each roll will be covered with a wrapping material that will protect the geotextile from damage due to shipment, water, sunlight, or contaminants.

The following practices will be used as a minimum in receiving and storing geotextile rolls in the designated storage area at the job site:

- While unloading or transferring the geotextile rolls from one location to another, care will be taken to prevent damage to the wrapping or to the geotextile itself. If practicable, the Installer may use fork lift trucks fitted with poles that can be inserted into the cores of rolls. The poles will be at least two-thirds the length of the rolls, to prevent breaking the cores and possibly damaging the geotextile. Rolls will not be dragged.
- The geotextile rolls will be stored in such a manner so as to ensure that they are adequately protected from the following:
    - Precipitation
    - Ultraviolet radiation, including sunlight
    - Strong oxidizing chemicals, acids or bases
    - Flames, including welding sparks
    - Temperatures in excess of 160°F
    - Soiling

The RPR will observe and document, throughout the preinstallation, installation, and post-installation periods, that the Installer provides adequate handling equipment used for moving geotextile rolls and that the equipment and handling methods used do not pose unnecessary risk of damage. The Installer will be responsible for the means and methods to implement the work.

The Installer will be responsible for ensuring that all materials installed meet specifications (*i.e.*, the roll marking label information indicates required specifications and properly represents materials). The RPR will maintain a log of geotextile roll deliveries. The following information, at a minimum, will be recorded on the log for each shipment received at the job site:

- Date of delivery at job site
- For each geotextile roll, the following information:

- Roll number
- Batch (lot) number

10.3 Installation

This section describes the quality assurance requirements applicable to the installation, observation, and documentation of geotextile.

10.3.1 Placement

The Installer will install all geotextile in such a manner so as to ensure that it is not damaged and in a manner that complies with the following requirements:

- On sideslopes, the geotextile will be securely anchored and then rolled down the slope in such a manner so as to continually keep the geotextile in tension.
- In the presence of wind, all geotextile will be secured by suitable methods. The temporary securing material will be left in place until replaced with cover material as shown on the design plans and specifications.
- The Installer will take the necessary precautions to prevent damage to any underlying layers during placement of the geotextile.
- During placement of the geotextile, care will be taken not to entrap in the geotextile any stones, excessive dust, or moisture that could damage the geotextile.

10.3.2 Overlaps

The following requirements will be met with regard to overlapping of geotextile rolls:

- Geotextile will be overlapped a minimum of 5 feet, per Manufacturer's recommendation.

The RPR will be responsible for observing and documenting that the above provisions are performed by the Installer in an acceptable manner.

10.4 Post-Installation

10.4.1 Final Examination

The RPR will perform a final geotextile examination after the installation of each geotextile layer has been completed. The objectives of the final examination are as follows:

- To examine for the presence of holes, tears, or other deterioration
- To examine geotextile for excessive tension due to stretching of the fabric during installation

If there will be an extended time delay between completion of the geotextile and the start of the installation of any overlying cover, then the Installer will make provisions, by temporarily

covering or using other suitable methods, to protect the geotextile against exposure to sunlight and ultraviolet radiation.

10.4.2 Placement of Soil Materials

The Construction Contractor will place all soil materials located on top of a geotextile in such a manner so as to minimize the following:

- Slippage of the geotextile on underlying layers
- Excessive tensile stresses imposed on the geotextile

Section 11
Erosion Control Matting

11.1 General

This section is divided into three major subheadings, which cover the quality assurance requirements for preinstallation, installation, and post-installation of the erosion control matting. The terms preinstallation, installation, and post-installation are applicable only to the geocomposite and do not apply to the overall construction of the landfill facility.

11.2 Preinstallation

11.2.1 Manufacturing

The erosion control matting will be composed of 100% synthetic material and will contain no biodegradable or photodegradable components or materials. The erosion control matting will be a three-dimensional matrix and will maintain the three-dimensional stability without laminated or stitched layers. The erosion control matting will have a sufficient area holding capacity and a minimum 90 percent open space available for soil and root interaction. The erosion control matting will not lose its structural integrity and will not unravel or separate when cut in the field. The erosion control matting will exhibit no buoyancy factor (the specific gravity of the fibers used should be greater than 1.0) so as to allow the erosion control matting to maintain intimate contact with the soil under low flow conditions. The erosion control matting shall meet the requirements of Table 11-1.

11.2.2 Delivery, Handling, and Storage of Geocomposite Rolls

Each erosion control matting roll, for use at the landfill facility, will be marked by the Manufacturer with the following information and in the following manner:

- When fabric is rolled on a core, each roll will be identified with a durable gummed label, or an equivalent, on the inside of the core and on the outside of the protective wrapping for the roll.

Table 11-1
Erosion Control Matting Specifications

PROPERTY	TEST	UNITS	VALUE
Mass/unit area	ASTM D5261	oz/yd^3	8.0
Thickness	ASTM D5199	Inches	0.4
Tensile strength (MD)	ASTM D5035	lb/ft	160
Area holding capacity	Calculated	in^3/yd^3	450
Porosity	Calculated	%	> 95
UV stability	ASTM D1682	% retained strength	80
Velocity 30 min. vegetated 50 hr. vegetated	Flume testing	ft/sec	 19 14
Shear 30 min. vegetated 50 hr. vegetated	Flume testing	lb/ft^2	 8.0 6.0

- Each roll label will contain the following information, at a minimum:
  - Name of manufacturer (or fabricator)
  - Style and type number
  - Roll length and width
  - Batch (or lot) number, if applicable
  - Date of manufacture
  - Direction for unrolling
  - Roll number
- On the outside of the roll, all lettering will be a minimum ½ inch high; and on the inside of the core, the lettering will be at least ¼ inch high.

The Manufacturer will use the following guidelines in packaging, wrapping, and preparing all erosion control matting rolls for shipment:

- When cores are required, those that have a crushing strength sufficient to avoid collapse or other damage while in use will be used.
- Each roll will be covered with a wrapping material that will protect the erosion control matting from damage due to shipment, water, sunlight, or contaminants.

At a minimum, the following practices will be followed in receiving and storing the erosion control matting rolls in the covered storage area at the job site:

- While unloading or transferring the erosion control matting rolls from one location to another, care will be taken to prevent damage to the erosion control matting. If practicable, fork lift trucks fitted with poles that can be inserted into the cores of rolls will be used. The poles will be at least two-thirds the length of the rolls to avoid breaking the cores and possibly damaging the erosion control matting. Rolls will not be dragged.
- The erosion control matting rolls will be stored in a manner so as to ensure that they are adequately covered to protect the erosion control matting from the following:
    - Precipitation
    - Ultraviolet radiation, including sunlight
    - Strong oxidizing chemicals, acids or bases
    - Flames, including welding sparks
    - Temperatures in excess of 160° F

The RPR will be responsible throughout the preinstallation, installation, and post-installation periods for observing and documenting that the Installer provides adequate handling equipment used for moving the erosion control matting rolls and that the equipment and handling methods used do not pose any risk of damage.

The RPR will maintain a log of erosion control matting roll deliveries. The following information, at a minimum, will be recorded on the log for each shipment received at the job site:

- Date of delivery at job site
- For each erosion control matting roll, the following information:
    - Roll number
    - Batch (lot) number, if applicable

11.3 Installation

11.3.1 Placement

The Installer will install all erosion control matting in such a manner so as to ensure that it is not damaged in any way, and in a manner that complies with the following:

- The erosion control matting will be securely anchored, and then rolled down the slope in such a manner so as to continually keep the erosion control matting in tension, per the Manufacturer's specifications. If necessary, the erosion control matting will be positioned by hand after being unrolled to minimize wrinkles. Horizontal placement of the erosion control matting on sideslopes will not be allowed.
- In the presence of wind, all erosion control matting will be secured by suitable methods. The temporary weighted material will be left in place until replaced with cover material as shown on the design Plans and Specifications.
- Cutting will be done according to Manufacturer's recommendations.

- The Installer will take necessary precautions to prevent damage to any underlying layers during placement of the erosion control matting.
- During placement of the erosion control matting, care will be taken not to entrap any stones, soil clods, or clumps that would prevent the erosion control matting from lying flush to the ground surface.

The RPR will observe and document that each of the above steps is performed by the Installer. Any noncompliance with the above requirements will be reported by the RPR.

11.3.2 Overlaps and Joining

The following requirements will be used with regard to the overlapping and joining of erosion control matting rolls:

- The erosion control matting will be overlapped 4 inches between rolls. The rolls will be shingled in the direction of water flow. The erosion control matting will be overlapped 3 feet between splices of rolls.
- The Installer will pay particular attention to the overlapped areas to ensure that no earthen or foreign materials could be inadvertently trapped beneath the erosion control matting.

11.3.3 Anchor Trench and Pinning

The following requirements will be used with regard to the anchor trench and pinning of erosion control matting rolls:

- The erosion control matting will be installed into the bottom of the trench and fastened with pins spaced 3 feet apart. The anchor trench will then be backfilled and compacted in a manner so as not to damage the erosion control matting.
- Pins will be installed down the center of each mat staggering them between the outside pins with a spacing of 3 to 5 feet.
- Two rows of pins spaced 1.5 x 1.5 feet apart will be installed at all roll splice locations.

11.3.4 Seeding

- Broadcast seed or hydroseed over the installed erosion control matting.
- Hydromulch after seeding.
- Apply supplemental water over the seeded area.

The RPR will observe and document that each of the above steps is performed by the Installer. Any noncompliance with the above requirements will be reported by the RPR to the CQA Officer.

11.3.5 Repairs

Any tears or other defects in the erosion control matting will be repaired by placing a patch with the minimum overlaps described in Subsection 11.3.2. The patch will be secured to the original erosion control matting by pinning every 6 inches. If the tear or other defect width is more than 50 percent of the roll width, the damaged area will be cut out and replaced with new erosion control matting. Pinning devices will be as indicated in Subsection 11.3.2.

The RPR will examine and document that the repair of any erosion control matting is performed according to the above procedure.

11.4 Post-Installation

11.4.1 Final Examination

The RPR will perform a final erosion control matting examination after installation has been completed. The objectives of this step are as follows:

- To examine for the presence of tears or defects
- To examine overlaps to make certain that they are in conformance with the requirements of Subsection 11.3.2

If any portion of the erosion control matting requires repairs due to the above examination, the repairs will then be performed according to the procedures in Subsection 11.3.3.

If there will be an extended delay between completion of the erosion control matting and seeding, then the Installer will make provisions, by temporarily covering, or other suitable methods, to protect the erosion control matting against exposure to sunlight and ultraviolet degradation.